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**PCT**

**NOTIFICATION OF ELECTION**

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner  
US Department of Commerce  
United States Patent and Trademark  
Office, PCT  
2011 South Clark Place Room  
CP2/5C24  
Arlington, VA 22202  
ETATS-UNIS D'AMERIQUE  
in its capacity as elected Office

<b>Date of mailing (day/month/year)</b> 21 May 2001 (21.05.01)	
<b>International application No.</b> PCT/GB00/03511	<b>Applicant's or agent's file reference</b> P&S
<b>International filing date (day/month/year)</b> 13 September 2000 (13.09.00)	<b>Priority date (day/month/year)</b> 13 September 1999 (13.09.99)
<b>Applicant</b> VAN ROON, Mark et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:  
12 April 2001 (12.04.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was  
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<b>The International Bureau of WIPO</b> 34, chemin des Colombettes 1211 Geneva 20, Switzerland  Facsimile No.: (41-22) 740.14.35	<b>Authorized officer</b>  Pascal Piriou  Telephone No.: (41-22) 338.83.38
--	--

PCT

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## DECLARATION OF NON-ESTABLISHMENT OF INTERNATIONAL SEARCH REPORT

(PCT Article 17(2)(a), Rules 13ter.1(c) and Rule 39)

Applicant's or agent's file reference <b>P&amp;S</b>	IMPORTANT DECLARATION	Date of mailing(day/month/year) <b>26/03/2002</b>
International application No. <b>PCT/GB 00/ 03511</b>	International filing date(day/month/year) <b>13/09/2000</b>	(Earliest) Priority date(day/month/year) <b>13/09/1999</b>
International Patent Classification (IPC) or both national classification and IPC		<b>G06F17/60</b>
Applicant <b>BUYFX.COM LIMITED et al.</b>		

This International Searching Authority hereby declares, according to Article 17(2)(a), that **no international search report will be established on the international application for the reasons indicated below**

1. ☒ The subject matter of the international application relates to:

- a. ☐ scientific theories.
- b. ☐ mathematical theories
- c. ☐ plant varieties.
- d. ☐ animal varieties.
- e. ☐ essentially biological processes for the production of plants and animals, other than microbiological processes and the products of such processes.
- f. ☒ schemes, rules or methods of doing business.
- g. ☐ schemes, rules or methods of performing purely mental acts.
- h. ☐ schemes, rules or methods of playing games.
- i. ☐ methods for treatment of the human body by surgery or therapy.
- j. ☐ methods for treatment of the animal body by surgery or therapy.
- k. ☐ diagnostic methods practised on the human or animal body.
- l. ☐ mere presentations of information.
- m. ☐ computer programs for which this International Searching Authority is not equipped to search prior art.

**RECEIVED**  
OCT 07 2002  
**GROUP 3600**

2. ☐ The failure of the following parts of the international application to comply with prescribed requirements prevents a meaningful search from being carried out:

- ☐ the description      ☐ the claims      ☐ the drawings

3. ☐ The failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions prevents a meaningful search from being carried out:

- ☐ the written form has not been furnished or does not comply with the standard.  
☐ the computer readable form has not been furnished or does not comply with the standard.

4. Further comments:

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk  
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,  
Fax: (+31-70) 340-3016

Authorized officer

*George Chatzarakis*

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 203

The claims relate to subject matter for which no search is required according to Rule 39 PCT. Given that the claims are formulated in terms of such subject matter or merely specify commonplace features relating to its technological implementation, the search examiner could not establish any technical problem which might potentially have required an inventive step to overcome. Hence it was not possible to carry out a meaningful search into the state of the art (Art. 17(2)(a)(i) and (ii) PCT; see Guidelines Part B Chapter VIII, 1-6).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

## PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

ORIGIN LIMITED

52 Muswell Hill Road  
London N10 2EJ

ROYAUME-UNI

DATE RECEIVED

30 March 2001

DEADLINE ENTERED

COMMENT

## IMPORTANT NOTICE

Date of mailing (day/month/year)

22 March 2001 (22.03.01)

Applicant's or agent's file reference

P&amp;S

International application No.

PCT/GB00/03511

International filing date (day/month/year)

13 September 2000 (13.09.00)

Priority date (day/month/year)

13 September 1999 (13.09.99)

Applicant

BUYFX.COM LIMITED et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
- AU,US**

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
- CA,CN,EP,GB,JP,MX**

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 22 March 2001 (22.03.01) under No. WO 01/20508

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO  
34, chemin des Colombettes  
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

J. Zahra

Telephone No. (41-22) 338.83.38

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ \_\_\_\_\_

# PCT

## CHAPTER II

### DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty.

For International Preliminary Examining Authority use only

Identification of IPEA	Date of receipt of DEMAND
------------------------	---------------------------

<b>Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION</b>		Applicant's or agent's file reference <b>P&amp;S PCT</b>
International application No. <b>PCT/GB00/03511</b>	International filing date (day/month/year) <b>13 September 2000 (13.09.00)</b>	(Earliest) Priority date (day/month/year) <b>13 September 1999 (13.09.99)</b>
Title of invention <b>Method and apparatus for multi-currency funds settlement</b>		
<b>Box No. II APPLICANT(S)</b>		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)  <b>BuyFX.com Limited</b> <b>41 Cedar Avenue,</b> <b>P.O. Box HM 1179,</b> <b>Hamilton HMEX</b>  <b>Bermuda</b>		Telephone No.:  Facsimile No.:  Teleprinter No.:
State (i.e. country) of nationality: <b>Bermuda</b>		State (i.e. country) of residence: <b>Bermuda</b>
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) <b>VAN ROON, Mark</b> <b>40 Hayward Crescent</b> <b>Guelph, Ontario</b> <b>N1M 1J7</b> <b>Canada</b>		
State (i.e. country) of nationality: <b>Canada</b>		State (i.e. country) of residence: <b>Canada</b>
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) <b>LANGLEY, Peter James</b> <b>52 Muswell Hill Road</b> <b>London N10 3JR</b> <b>GB</b>		
State (i.e. country) of nationality: <b>GB</b>		State (i.e. country) of residence: <b>GB</b>
<input checked="" type="checkbox"/> Further applicants are indicated on a continuation sheet.		

Sheet No. ...2...

International application No.

PCT/GB00/03511

Continuation of Box No. II

APPLICANT(S)

*If none of the following sub-bases is used, this sheet is not to be included in the demand**Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

**BOOTH, John**  
40 Hayward Crescent  
Guelph, Ontario  
N1M 1J7  
Canada

State (i.e. country) of nationality: **Canada**State (i.e. country) of residence: **Canada***Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State (i.e. country) of nationality:

State (i.e. country) of residence:

*Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State (i.e. country) of nationality:

State (i.e. country) of residence:

*Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State (i.e. country) of nationality:

State (i.e. country) of residence:



Further applicants are indicated on another continuation sheet.

Sheet No. ... 3. ...

International application No.  
**PCT/GB00/03511****Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE**

The following person is ☒ agent ☐ common representative  
 and ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.  
☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.  
☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

Origin Limited  
 52 Muswell Hill Road  
 London N10 3JR  
 GB

Telephone No.:  
**+44-208-444-2148**

Facsimile No.:  
**+44-208-444-4137**

Teleprinter No.:

☐ Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

**Box No. IV STATEMENT CONCERNING AMENDMENTS**

The applicant wishes the International Preliminary Examining Authority\*

(i) ☒ to start the international preliminary examination on the basis of the international application as originally filed.

(ii) ☐ to take into account the amendments under Article 34 of

☐ the description (amendments attached).

☐ the claims (amendments attached).

☐ the drawings (amendments attached).

(iii) ☐ to take into account any amendments of the claims under Article 19 filed with the International Bureau (a copy is attached).

(iv) ☐ to disregard any amendments of the claims made under Article 19 and to consider them as reversed.

(v) ☐ to postpone the start of the international preliminary examination until the expiration of 20 months from the priority date unless that Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

\* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

**Box No. V ELECTION OF STATES**

The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)* except:

*(If the applicant does not wish to elect certain eligible States, the name(s) or country code(s) of those States must be indicated above.)*



Sheet No. ... 4 ...

International application No.  
**PCT/GB00/03511****Box No. VI CHECK LIST**

The demand is accompanied by the following documents for the purposes of international preliminary examination:

## 1. amendments under Article 34

description	:	sheets
claims	:	sheets
drawings	:	sheets

## 2. letter accompanying amendments under Article 34

: sheets

## 3. copy of amendments under Article 19

: sheets

## 4. copy of statement under Article 19

: sheets

## 5. other (specify):

: sheets

For International Preliminary  
Examining Authority use only

received

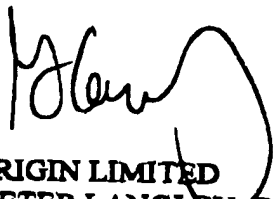
not received

☐☐☐☐☐☐☐☐☐☐☐☐☐☐

The demand is also accompanied by the item(s) marked below:

1. ☐ separate signed power of attorney4. ☒ fee calculation sheet2. ☐ copy of general power of attorney5. ☐ other (specify):3. ☐ statement explaining lack of signature**Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE**

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).


**ORIGIN LIMITED  
(PETER LANGLEY, DIRECTOR)**

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply.☐

The applicant has been informed accordingly.

4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.3.5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

## PCT

## CHAPTER II

## FEE CALCULATION SHEET

Annex to the Demand for International preliminary examination

International application No. <b>PCT/GB00/03511</b>	For International Preliminary Examining Authority use only
Applicant's or agent's file reference <b>P&amp;S PCT</b>	Date stamp of the IPEA
Applicant <b>BuyFX.com Limited</b>	
Calculation of prescribed fees	
1. Preliminary examination fee .....	Euros 1533 <span style="border: 1px solid black; padding: 0 5px;">P</span>
2. Handling fee ( <i>Applicants from certain States are entitled to a reduction of 75% of the handling fee. Where the applicant is (or all applicants are) so entitled, the amount to be entered at H is 25% of the handling fee.</i> ) .....	Euros 147 <span style="border: 1px solid black; padding: 0 5px;">H</span>
3. Total of prescribed fees Add the amounts entered at P and H and enter total in the TOTAL box .....	<div style="border: 1px solid black; padding: 5px; display: inline-block;">Euros 1680</div> <div style="border: 1px solid black; padding: 5px; display: inline-block;">TOTAL</div>
Mode of Payment	
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <input checked="" type="checkbox"/> authorization to charge deposit account with the IPEA (see below)           </div> <div style="width: 45%;"> <input type="checkbox"/> cash           </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> cheque           </div> <div style="width: 45%;"> <input type="checkbox"/> revenue stamps           </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> postal money order           </div> <div style="width: 45%;"> <input type="checkbox"/> coupons           </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 5px;"> <div style="width: 45%;"> <input type="checkbox"/> bank draft           </div> <div style="width: 45%;"> <input type="checkbox"/> other (specify):           </div> </div>	
Deposit Account Authorization ( <i>this mode of payment may not be available at all IPEAs</i> )	
The IPEA <span style="border: 1px solid black; padding: 0 5px;">X</span> is hereby authorized to charge the total fees indicated above to my deposit account.	
<div style="display: flex; align-items: flex-start;"> <div style="margin-right: 20px;"> <input checked="" type="checkbox"/> </div> <div> <i>(this check-box may be marked only if the conditions for deposit accounts of the IPEA so permit)</i> is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.         </div> </div>	
<div style="border: 1px solid black; padding: 5px; display: inline-block;">28050304</div>	12 April 2001
Deposit Account Number	Date (day/month/year)
<div style="display: flex; align-items: center;"> <div>             Signature              (Peter Langley, Origin Ltd)           </div> </div>	

## PATENT COOPERATION TREATY

PCT

From the  
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

ORIGIN LIMITED  
52 Muswell Hill Road  
LONDON N10 3JR  
GRANDE BRETAGNE

ORIGIN LIMITED

DATE RECEIVED

2 May 2001

DEMAND ENTERED

COMMENT

NOTIFICATION OF RECEIPT  
OF DEMAND BY COMPETENT INTERNATIONAL  
PRELIMINARY EXAMINING AUTHORITY(PCT Rules 59.3(e) and 61.1(b), first sentence  
and Administrative Instructions, Section 601(a))Date of mailing  
(day/month/year)

30. 04. 01

Applicant's or agent's file reference

P&amp;S PCT

## IMPORTANT NOTIFICATION

International application No.

PCT/GB 00/03511

International filing date (day/month/year)

13/09/2000

Priority date (day/month/year)

13/09/1999

Applicant

BUYFX.COM LIMITED et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority considers the following date as the date of receipt of the demand for international preliminary examination of the international application:

12/04/2001

2. This date of receipt is:

- ☒ the actual date of receipt of the demand by this Authority (Rule 61.1(b)).  
☐ the actual date of receipt of the demand on behalf of this Authority (Rule 59.3(e)).  
☐ the date on which this Authority has, in response to the invitation to correct defects in the demand (Form PCT/IPEA/404), received the required corrections.

3. ☐ **ATTENTION:** That date of receipt is **AFTER** the expiration of 19 months from the priority date. Consequently, the election(s) made in the demand does (do) not have the effect of postponing the entry into the national phase until 30 months from the priority date (or later in some Offices) (Article 39(1)). Therefore, the acts for entry into the national phase must be performed within 20 months from the priority date (or later in some Offices) (Article 22). For details, see the PCT Applicant's Guide, Volume II.

- ☐ (If applicable) This notification confirms the information given by telephone, facsimile transmission or in person on:

4. Only where paragraph 3 applies, a copy of this notification has been sent to the International Bureau.

Name and mailing address of the IPEA/

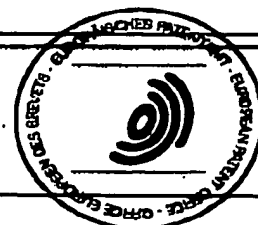


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Authorized officer

KAUFMANN S B

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10/p12B

Docket No. 5085 J1188S  
Express Mail Certificate EL640215275US  
10/088328  
JCS Rec'd P37PTC 13 MAR 2002

**METHOD AND APPARATUS FOR MULTI-CURRENCY FUNDS  
SETTLEMENT**

**INVENTORS: Mark Van Roon and John Booth**

5

**Field of the Invention**

The present invention relates to a method of and apparatus for multi-currency funds settlement.

**Description of the Prior Art**

10

The Internet offers the promise of allowing buyers and sellers of goods and services to communicate directly with one another, eliminating the need for some of the intermediaries and the associated economic inefficiencies present in conventional selling. Hence, for example, it is in 1999 possible to transact many kinds of business using the Internet, which formerly would have required a broker or agent. Examples include the

15

purchase of insurance, airline tickets, books and holidays.

The Internet also enables new models of buying and selling as well: for example, there are now many Internet auction sites, on which a wide range of goods and services are auctioned to the highest bidder, with the seller merely setting a reserve price or a bid start price. The terms to 'buy' and 'sell' and related expressions should be broadly

20 construed to include any kind of transfer of rights or interests; 'buyers' and 'sellers' should be also broadly construed to include any transferee and transferor of any kind of right or interest. The terms 'party' and 'counterparty' are commonly used to describe a situation in which a given party is both a buyer and simultaneously a seller. This can arise, for example, where a party wishes to exchange US\$100 for the equivalent in

25 Sterling. That party is simultaneously a seller of US\$ and a buyer of Sterling.

25

Computer systems linking many potential buyers and sellers of goods and services over an extensive computer network also existed prior to the widespread adoption of the Internet, particularly in the financial services sector. One example is the foreign exchange dealing systems developed and run by organizations such as Reuters

30 PLC and the EBS Partnership. In these systems, banks post the prices at which they are willing to buy or sell defined quantities of currencies. The systems may automatically spot matches – i.e. where a buyer is willing to buy at a price at which a seller is willing to sell – and complete the trade. If a potential buyer of currency can find no-one willing to

sell at a price it considers low enough, then typically, that potential buyer will simply have to either wait for the pricing in the market to become more favorable, or else be prepared to pay more. Such systems are commonly used for currency speculation, namely taking a trading position with respect to one or more given currencies to exploit favorable pricing movements.

Where a buyer and seller regularly trade with one another, it is normal to aggregate all transactions over a defined period of time and for just a single net payment to be made. Hence, for example, if party A buys 50 units at \$1 from party B over a week, and counterparty B buys 20 units at \$1 from party A over that same week, then the respective payment obligations can be netted off so that A pays \$30 to B at the end of the week. This same principle applies to the more sophisticated environment of trading foreign exchange and other financial property. Where more than a single party and counter-party pair are involved, for example, a 3 way group or even higher orders, multilateral netting can be applied.

Netting systems should minimise the number of intra and inter company receipts and payments, which incur float costs in the banking system. Netting reduces the total payments (cost and credit structure improvement), the number of transactions (cost and system architecture improvement), and often, the risk in a transaction system (credit structure improvement). To illustrate this concept, if UKCorp1 owes UKCorp2 100 Pounds Sterling and UKCorp2 owes UKCorp3 100 Pounds Sterling, then UKCorp1 could pay UKCorp3 100 Pounds directly thereby reducing the payments from 200 Pounds total to 100 Pounds, and the number of transactions from 2 to 1.

In addition to the need for speculative currency trading, there exists also a very substantial need for corporations to buy and sell foreign currency, for example, to pay overseas suppliers. Similarly, individuals travelling abroad or making foreign investments need to obtain foreign currencies as well. Currently, corporations and individuals will approach a bank or foreign currency vendor (such as American Express Inc.) to obtain foreign currency. The bank or foreign currency vendor will in turn often have obtained its stocks of foreign currency from other banks, in many cases having used an inter-bank trading system such as the Reuters or EBS systems. Because of the chain of intermediaries, the transaction cost of buying or selling foreign exchange in this way is

quite high: this is reflected in the commission charged and the difference between the bid and the offer prices: a bank will typically sell foreign currency at a rate considerably higher than the rate at which it will buy it back. For small transactions, the difference can be 4%. For larger transactions, the difference is typically 5 basis points.

5           The mechanics of cross border payments is quite complex. For example, take the situation, where a company C in the US, with US dollars in a US account, wishes to pay a supplier in England in Sterling. Assume also that company C has to pay a supplier in Sterling but has no Sterling receivables to do so. The typical procedure, required for this transaction to be completed using a wire transfer process is as follows:

10           A.     Funds are debited from C's US home bank account immediately on direction to wire transfer and the US dollar funds credited to the US home bank, typically in a general account. A wire transfer is therefore in respect of "final or cleared funds". Depending on the nature of the transfer, a foreign exchange component may be completed between the originator and his financial institution.

15           B.     In most cases, the wire transfer direction to pay is a "push driven" process, in which funds are directed to the international clearing banks (originating and/or receiving) via SWIFT or a network of correspondent financial institutions. In the case of Company C's funds, the US Dollars now resident in a general account of C's home bank are credited to the account of the correspondent or network bank and the chain of  
20           correspondent debits and credits begins until the funds are credited to the ultimate beneficiary account. The "direct clearer" or correspondent bank in the receiving country is ultimately responsible to push the funds to the receiving bank, who subsequently directs the funds to the beneficiary. The domestic component of the wire transfer typically occurs via the domestic payment system. It is common for each country to have  
25           multiple international clearing banks that have correspondent relationships with international clearing banks in other countries and that operate domestically with the payment system. Examples include Barclays Bank, Toronto Dominion Bank, Chase Manhattan Bank, and The US Federal Reserve.

          C.     In the case of a US Dollar to Sterling wire transfer, the UK clearer  
30           transfers the funds from the US bank's "GBP nostro" account (either the home bank if it has a nostro account or the correspondent US bank having a nostro account) to the

account with the UK correspondent bank and then to the bank of the wire transfer receiver (if they are not the same) through the UK domestic payment system. Hence C has met its obligation in the UK. A US FI's GBP nostro is a bank account held at a GB FI in the name of the US FI but holding the currency of the foreign jurisdiction, in this case GBP.

This process is relatively expensive and involves numerous participants: Two international clearers, one per country, typically two correspondent banks having nostro accounts with each other, two home banks one each for receiver and originator, and two transactors, an originator and a receiver. Further to that, a push driven system is open to processing delays as financial institutions seek to maximise the use of available funds as part of their overnight float and hence only move the funds when absolutely necessary.

### Summary of the Invention

In accordance with a first aspect of the invention, the method of multi-currency funds settlement comprises the following steps:

funds in a currency X of a first legal person who is situated in country  $X^1$  are transferred in whole or part within country  $X^1$  to satisfy in whole or part the currency  $X^1$  payment obligations of a second legal person, situated in a different country  $Y^1$ ;

and the funds in a currency Y of that second legal person situated in country  $Y^1$  are transferred in whole or part within country  $Y^1$  to satisfy in whole or part the currency Y payment obligations of a legal person, who may be the first legal person or one or more different or additional legal persons.

Hence, the essential principle is for cross border multi-currency payment obligations to be met not with conventional complex and expensive FX transactions, but instead with legal persons (typically corporations) in different countries in effect assigning, novating, swapping or otherwise altering payment obligations so that funds of a party in one country remain in that country and are used to meet the payment obligations in that country of a party outside of that country. The term 'assigning' will be used in this specification to cover any such kind of alteration of payment obligations and is not limited to a legal or equitable assignment as such.

Clearly, full settlement of payment obligations is unlikely to occur where the total system involves only 2 parties and 2 countries, although this too is possible if both parties

have corresponding bank accounts in both of the relevant jurisdictions (4 accounts total). The practical realisation of the present invention therefore likely occurs in multi-party, multi country situations, where, given sufficient fund volumes and diversity, all or virtually all payment obligations can be fully satisfied. With sufficient fund diversity and volumes, most if not all multi-currency cross border settlements can be satisfied using solely domestic transactions: only the residual elements left over after all domestic transactions have been netted off require genuine cross-border settlement. This inherently operates as a risk reduction mechanism as the bank never takes a principal position, but rather acts solely as a custodian. It further reduces the amount that can ever be in dispute by only ever using precleared funds of the various participants. Therefore in the event of a problem, which requires transaction unwinding, the most at risk for any party is the gain or loss associated with the interim movement in exchange rates between the relevant currencies.

In a second aspect, there is a computer program receiving data defining the non-domestic payment obligations of parties located in two or more countries, and programmed to identify opportunities to satisfy those non-domestic payment obligations by assigning payment obligations using the funds settlement method defined above.

A third aspect of the invention is a computer server programmed with the computer program of the second aspect.

A fourth aspect is a computer terminal acting as a client, in which the client accepts from a party a foreign exchange requirement and sends that requirement to a server as defined in the third aspect.

A fifth aspect is a computer based system which enables parties located in two or more jurisdictions to meet their foreign currency payment obligations, comprising a first computer terminal into which a party located in a first jurisdiction inputs details of a potential first foreign currency financial transaction, a second computer terminal into which a second party located in a second jurisdiction inputs details of a potential second financial transaction, a computer network connecting the first and second terminals; characterized in there being a computer program arranged to determine if any transfer of funds from the first party to a payee located in the first jurisdiction satisfies in whole or part the requirement of the second party to transfer funds to that payee. Instead of a



merely bi-lateral system, in a practical implementation there may be numerous computer terminals in numerous countries and the computer program is then arranged to determine if any transfer of funds from a party to a payee located in the jurisdiction of that party satisfies in whole or part the requirement of another party to transfer funds to that payee.

5       The present invention utilises and exploits a special aspect of currency dealing, namely that the currency of any country does not, typically, ever leave that country. That is to say, for example, a US dollar account in Canada is merely a Canadian dollar account with a conversion factor to a US dollar equivalent.

10       The present invention utilises a computer-based system to restructure the method of payment and settlement to reduce the number of participants, thereby streamlining the procedure and improving efficiency.

#### **Brief Description of the Drawings**

The invention will be described in more detail with reference to:

15       Figure 1 which is a diagram representing the bid/offer pricing for USD priced in CAD;

      Figures 2A, 2B and 2C which is a table showing how a FX netting 'hybrid' system can operate;

      Figures 3A and 3B, which are schematic depictions of a computer based system which enables buyers and sellers of foreign exchange to be efficiently matched; and

20       Figure 4, which is a schematic representing the key steps in the system as applied to FX matching; and

      Figure 5, which illustrates the mechanics and benefits of transactions netting

      Figure 6 which is simplified schematic showing the principle of the payment approach of the present invention

25       Figure 7 which is a table relating to an example of a series of payments made using the present invention and

      Figure 8, which is a schematic of the computer system for implementing international payments as defined in the present invention.

#### **Detailed Description**

30       The present invention will be described with reference to various examples, as illustrated in the attached Figures.

Currently, banks broker foreign exchange transactions, providing an intermediary to purchase and sell currency for both theirs' and their clients' accounts. For each transaction the bank garners the "spread", typically 5 basis points on large transactions and up to 4% on smaller transactions.

5 In the present invention, the appropriate underlying transactional software allows one end user of the foreign exchange (e.g. a first corporation, Corporation A, doing a cross border procurement) to liase directly or indirectly with a counterparty, a second corporation, Corporation B, which requires the home currency of Corporation A. The bank brokering function, as it pertains to the financial instrument itself, can be reshaped; that is, the spread currently absorbed by the two sample corporations could be reduced or  
10 negated. Each party might therefore improve its cash position by one half the value of the spread that they would incur, for example on a 5 basis points spread, the corporation would improve its position by 2.5 basis points. For smaller customers the savings on a percentage basis would be substantially greater.

15 Moreover, transactions could be executed in a multitude of dimensions: two way; three way; four way; etc, since the software would expose the transactional opportunities available to each of the clients. (This process is described in more detail in Appendices 1 & 3)

The overall system approach can best be understood through a sample problem:

20 **Sample problem**

Imagine the following:

1. That the spot price of CDN\$ is US\$ 1.5363 - 1.5373 at November 27/98.
2. That Corporation A is buying US \$1M to purchase equipment at a cost of  
25 CDN \$1,537,300.00. Corporation A. has CDN \$1,536,800.00 on account with a bank for the transaction (note: this assumes that the bank provides the best rate to Corporation A).
3. That Corporation B has US\$1M on account with the bank but requires  
CDN\$1,536,300.00 to purchase raw materials.

If the bank matches its own funds to supply Corporation A with US\$1M and Corporation B with CDN\$1,536,300.00, then it makes a profit of \$1,000.00 per \$million  
30 transacted. Although \$1,000 is a very small amount in the context of a significant \$1M

transaction, the total global volume of such transactions is extremely large, so that the cumulative profits to banks are very substantial.

In the present invention, the following occurs: Corporation A and B agree before transacting that they will do so at an exchange rate that is the mid-point of the posted  
5 Interbank rate, for example, the Interbank highest bid, lowest offer at the appropriate time. This is a fair compromise for each participant. Hence, the transaction can be completed automatically, rapidly and efficiently. The party and counterparty each deposit the funds needed to execute a transaction with a financial institution; the funds are preferably pre-cleared and are not marginable through the system. A sophisticated  
10 computer program determines that the party and counter-party are taking reciprocal positions, which can be matched against each other and instructs the relevant financial institutions to transfer the required foreign exchange as, in effect, a swap. By matching Corporation A with Corporation B, each of their positions is improved by \$500.00 per million, less a transaction fee to an intermediary of perhaps \$50.00 per side. The result is  
15 that Corporation A receives US\$1M for \$1,536,750 per million; a saving of \$450.00 per million; Corporation B Receives \$1,536,850 for US\$1M; an improvement in profit of \$450.00. The system has in effect reduced the spread to 1 basis point. The spread can theoretically be reduced to just short of zero since the present invention operates efficiently and automatically. This example works because of the exactly matching  
20 reciprocal requirements of the parties. In practice, that will rarely happen and some sort of netting will be required.

The fundamental netting concept applied in this embodiment is that a computer is programmed with information relating to a party and counterparty transaction, to determine a net payment position if both the first and second transactions were to occur  
25 and to actually complete each transaction on the basis of the net payment position.

This approach can be contrasted with conventional netting, in which a transaction is completed and only subsequently does netting occur to reduce the number and size of payments. Typically, there might be several party/counterparty pairs in a connected series of transactions in the present embodiment.

30

## Multilateral Netting Example

In the present system, it will be seen that the netting step is not simply a stage subsequent to but independent from the underlying exchange transaction, performed for accounting simplicity to reduce the numbers and sizes of cross-payments. Instead, it is an integral part of the underlying exchange transaction between party and counterparty. This is most clearly emphasised when considering a multi-party exchange of currencies. Take, for example, a situation in which there are 3 Corporations - A, B and C . A has CAD and needs JPY; B has JPY and needs USD; C has USD and needs CAD. The exact needs are shown in Figure 2A. A cannot satisfy its requirements in whole or in part by dealing with B exclusively. However, if C can be “linked” into the transaction, all three corporations can be satisfied to the value of the smallest available currency. (A more detailed example with multiple parties and jurisdictions is available for review in Appendices 1, 2, and 3).

We assume that the mid-point of Interbank B/O at a point in time is as follows: 1.53675 CAD; 1 USD; 88.7755 YEN; (i.e. all numbers are relative to the USD base currency).

The desired amounts indicated on Figure 2A reflect the mid-market value of the available currency. The post-match situation using this embodiment is shown on Figure 2B.

It will be noted that the limiting factor in this match example was the availability of CAD for JPY.

The embodiment uses a “currency link” to match partially or fully the desired quantities of the match. A currency link is created using the source currency and the beneficiary (desired) currency for a series of transactions. Figure 2C illustrates a simple three-way currency link.

Note, that if, for example, Party C wanted a currency other than AAA, say DDD, there would not be a currency link from which to synthesize a transaction.

A link is therefore defined as (A to B; B to A); or (A to B; B to C; C to A); or (A to B; B to C; C to D; D to A) etc. A mathematical relationship at a point in time therefore exists between the currencies. Another example is A to C, B to A and C to B.

The distinction from traditional netting programs is three-fold. First, netting in the present embodiment happens in “real-time”, not at a fixed point in time post transaction for various parties, none of which are necessarily the same from one “link” to the next, and consequently, from one “match” (whole or partial) to the next. Second, the program is designed to seek out the “currency linking” through a combination of user-defined parameters and system transaction rules. As complete matches occur (as in A above), the matched party drops out of the matrix or queue. The program seeks out the next currency links based on a set of transactions rules to fulfill wholly or partially the next match. Third, traditional netting occurs on completion of a series of transactions. For example, if Party A is obligated to pay Party B three units of a currency and Party B is obligated to pay Party C three units of a currency, a netting transaction would have Party A pay Party C three units of currency directly. In this embodiment, transactions are synthesized by matching source (available) currency to beneficiary (desired) currency requirements. As such the transaction could be deemed a netting ‘hybrid’.

The present system may be further understood with reference to Figures 3A and 3B, which each show a schematic of the major elements in a foreign exchange matching system in accordance with the present invention. Figure 3A is an actual proposed architecture schematic for a FX embodiment prepared by Primix Solutions Inc; the embodiment is called ‘BuyFX’. The functions of the major blocks in Figure 3A and 3B are the same and are as follows: the party and counterparty each interact with the foreign exchange matching system using their web browsers (1, 2), which communicate via the Internet 3 with a conventional Web cluster/firewall 4 connected to an application server cluster 5 running Netscape Application Server, IBM WebSphere or BEA WebLogic. Cluster 5 is connected to a message bus 7, such as ActiveWorks or Tibco. The message bus 7 is connected to a live data feed 6, which provides continuous and up to date pricing information. A Reuters or Bloomberg feed could be used. Message bus 7 is also connected to a mail server 8 who communicates with various entities, including the party and counterparty.

Message bus 7 is also connected to the matching system server 9, which runs a Java or C++ program calculating not only the mid-point prices (and related spreads, if applicable) using data from the live feed 6 but also identifying where netting

opportunities exist to enable a currency match to occur and the nature of the netting. Matching System server 9 is connected to an Oracle database 10. Message bus 7 is connected to the various system financial partners 11 (typically one, but not limited to one, in each jurisdiction whose currency is available for matching through the system).

5 These are typically banks or deposit taking institutions. These partners actually take the payment from and make payments 12 to each party and counterparty in the amounts defined by the matching system server 9.

Reference should now be made to Figure 4, which is a step by step walk through the process. Figure 4 includes, but is not limited to, the denoted steps to execute a  
10 transaction. At step 1, a party with a need for foreign exchange logs onto a secure web site using its browser. Initially, the party has to complete a customer profile and user authentication. This involves the following steps: On entering the secure FX Matching System web portal, the customer has to:

(A) Register with the FX Matching System and its jurisdictional banking  
15 partners in a secure environment (if a new user), or

(B) Authenticate its identity with a user name and password (if an existing user).

(C) If a new user, it also has to enter various administrator-defined restrictions- user restrictions, currency restrictions, volume restrictions e.g. User  
20 "XXXX" can transact in currency "XXX" and "YYY" only, in volumes not to exceed "XXXXXX".

Once authenticated as a user, the customer will be able to complete a secure submission document using its Web browser (Step 1). This document enables a user to:

(A) List, in a secure environment, commonly used source accounts and  
25 beneficiary accounts.

(B) Enter an electronic funds transfer request, with funds moving from a source account to a beneficiary account at a jurisdictional banking partner, if necessary.

Once its funds have been deposited and the cleared funds are "held" by a jurisdictional banking partner, the customer is able to 'post' funds using the browser  
30 based submission document as follows:

(A) By requesting a conversion on a defined source amount (e.g. the customer has a source quantity of \$1M USD which it requires to be converted to CAD), or

(B) By requesting a beneficiary amount, the computer program will calculate the quantity of source funds required, utilizing a "buffer percentage" to account for potential currency fluctuations. The "buffer percentage" is a convenience feature for customers and will be calculated on a currency specific basis at two standard deviations of the daily fluctuation of the currency.

The secure submission document also allows each user to define the kind of transaction required. Examples of user-defined functionality include, but are not limited to, the following:

(A) 'Match' – the exchange transaction is completed as and when reciprocal funds become available in whole or in a series of partials for a customer to fulfil a currency order; this process can be time-sensitive. Implicit in the Match order is end of day execution of any unfilled balances, unless the customer has his own beneficiary account and elects to bypass that option;

(B) 'Match (All or none)' – the exchange transaction is completed only as and when a complete block of currency (as a series of partials or in one reciprocating block) becomes available to fulfill a currency order; (again, this can be time-sensitive);

(C) 'Match and Market (M & M's)' – a time sensitive order to fill the customer currency requirement with as much "matched" currency as is available during a user-defined period of time, with the option of executing the balance at the prevailing market rate with a banking partner or financial institution;

(D) 'Market' – an order allowing a customer to bypass the matching process and go directly to a jurisdictional partner for execution; this can be time-sensitive;

(E) 'Special Liquidity' – certain corporate partners, and, in some circumstances, regular customers will be able to submit orders at preferred rates to augment liquidity. "D-SL" orders never have precedence over regular "Direct" orders.

The Submissions Document is then securely transmitted (step 2) to the Matching System Server (B). The Matching System Server (B) then requests (step 3) the appropriate financial institution (C) to verify the information given by the party (including the availability of funds) and to authenticate the user from the financial

institution's perspective. An account held with this multi jurisdictional financial partner(s) serves nothing but a transactional purpose through which funds are matched and distributed. The multi jurisdictional financial partner(s) accepts funds on account in the currency by which they were deposited. Correspondingly, this institution delivers  
5 funds to the customer in the beneficiary currency at the prescribed rate of exchange. All currency exchange is electronic so that no physical securities are required for clearing.

Once the financial institution (C) has confirmed that the user has the required funds to be exchanged it in effect freezes those funds, and then authorises the matching system (step 4) to post the required information and proceed with the transaction. The  
10 Matching System (D) then performs the netting identification process illustrated at Figure 2B, using the mid-point prices it calculates using the data from live feed (A). Matching System (D) uses the following order prioritisation feature. In order to prevent one company and/or transaction from "locking out" other customers by placing a substantial order in relation to the available liquidity, customers will be able to place orders to a  
15 maximum size of "X" USD equivalent. The software will accept volumes in excess of this size. These will be automatically processed into a series of smaller transactions, determined by the Matching System (D) and contingent on the liquidity of the currency. Execution of these smaller transaction volumes will occur in sequence with the initial block being completed on a "first in, first out", followed by the next Matching System  
20 (D) customers in that currency, if any, on a FIFO basis; followed by the second block from the transaction; followed by the next customers in that currency, if any, and so on until the cumulative volume is filled. This prevents one customer from monopolizing any one currency to the detriment of other customers.

Where a successful match has occurred, the Matching System (D) notifies the  
25 various financial institutions to complete the funds transfer. More exactly, transactions are aggregated by Matching System (D), reconciled, and recorded to one central file per jurisdictional financial institution. The "batched" files are transmitted to the jurisdictional partner (step 5).

Notification arises through the Matching System (D) issuing an 'International  
30 Payment Instruction'. This is an order to a financial partner to record payment instructions to a customer defined beneficiary account;



Issuance of the 'International Payment Instruction' will occur under, but will not be limited to, the following conditions:

- (A) When a customer is “matched” fully
- (B) When a customer is filled at the end of the day
- 5 (C) When a “Match and Market” order has been fulfilled.
- (D) If customer selects “Market” or “Match (All or none)” order.
- (E) If a customer elects to carry an order over a number of days, until that order is filled in its entirety, the direction to pay option to a Payee Account remains unavailable. In that circumstance, the customer must maintain his own beneficiary
- 10 account.

In addition to handling International Payment Instructions, the system can equally well handle Domestic Payment Instructions – for corporations who seek to transfer funds domestically.

In addition to issuing the International Payments Instruction, the Matching  
15 System (D) records the transaction details and time-stamps them. Pricing is also screened by the Matching System (D) for anomalous trades to ensure transaction integrity. Matching System (D) also causes an e-mail customer notification of a match to be issued, pending final payment and settlement.

Payment instructions are then confirmed, aggregated, and reconciled at the  
20 financial partner. Payment is subsequently effected (step 6) to the denoted beneficiary accounts (payee or customer). Each jurisdictional banking partner will release funds at the earliest available opportunity after the daily batching function. Confirmation details are recorded for transmission to customers; confirmation email and online transaction reporting details are transmitted to each customer (step 7). Call centre functionality  
25 allows customer to gain transaction details should their ISP be experiencing technical details. At step 8, each customer can obtain a transaction confirmation certificate (Step 9). The transaction is now fully completed.

There are various additional aspects to the FX Matching System, which are not illustrated. For example, a product for individuals (business travelers) is available; as is a  
30 corporate wholesale product for intermediary exchange requirements; and a “market” product for blue-chip multinationals. The transaction size in these incarnations may

dictate the transactions “fee” for executing a currency match; the program could, but does not have to automatically categorize the trade into the appropriate product with the appropriate rate scale.

5 Another use of the system is as an intra/inter corporate netting and money management facility (see The Mechanics of Netting Figure 5), in which currency requirements can be met as the intra corporate currency becomes available in other jurisdictions.

A hedging facility for foreign exchange exposure may also be included, in which matched forwards can be offered by the jurisdictional financial partner.

10 In addition, exposure positions are available to the multi jurisdictional financial partner(s) to mitigate systematic risk with one another.

The system can be implemented as a series of scalable products available for distribution through many different channels through the Internet; the customer may enter the system directly through the denoted web site to transact; the customer may enter via  
15 the web site of our multi jurisdictional partner(s) in a co-branded product, or the customer may enter via the web site of a multi jurisdictional partner in a “partner-branded aka white-branded” or non-branded interface. For the retail individual, an affiliation between the present system and a courier and travellers cheques company is possible. This enables a transaction to be completed anywhere in world with the traveller’s cheque couriered  
20 directly to the individual. This is envisaged as a premium service delivered via the Internet.

As explained above, the system can provide cross-border settlement of accounts, converted to the currency of choice, at exchange rates that represents the closest to fully efficient currency markets. This is particularly advantageous for the small/medium  
25 corporate user.

### **Clearing transactions**

In a preferred embodiment, there is a central clearer (or a group of clearers, presumably financial institutions), with access to the jurisdictions in which currency is both sourced and required. This could be a single financial institution or trustee, or a  
30 group of financial institutions or trustees which can secure the transactions. An account held with the clearing body serves nothing but a transactional purpose through which

funds are matched and distributed. The central clearer or its affiliates should have the ability to accept funds on account or with a financial institution in the currency by which they were deposited. Correspondingly, this institution delivers funds to the customer in the beneficiary currency at the prescribed rate of exchange. All currency exchange is electronic and no physical securities are required for clearing.

### **Payment & Settlement**

The simplest scheme involves 2 parties in 2 countries with equal and off-setting obligations. In the United Kingdom, imagine that a party C<sup>1</sup> has £1million GBP (Great Britain Pounds) in available funds in a bank account in the United Kingdom and needs to pay \$1.5million (US dollars) to its supplier A in the US. In the US, party C<sup>2</sup> has \$1.5million in available funds in a bank account and needs to pay £1million to its supplier B in the UK. Assume for simplicity that the exchange rate is \$1.5 per GBP. Conventionally, C<sup>1</sup> might wire transfer \$1.5million (US dollars) to supplier A in the US: that process involve the complex steps involving numerous parties explained in the Description of the Prior Art section of this specification.

Likewise, C<sup>2</sup> might wire transfer £1million to supplier B in the UK, with equivalent steps. This prior art process is however relatively expensive and slow. In the system of the present invention, shown in Figure 1, however, a central computer system is fed the payment obligations of each party, and rapidly spots that a simple swap of obligations is possible. It then causes party C<sup>1</sup>'s £1million to be paid to supplier B in settlement of C<sup>2</sup>'s payment obligation to supplier B and also causes C<sup>2</sup>'s \$1.5million to be paid to supplier A in settlement of C<sup>1</sup>'s payment obligation to supplier A.

As noted above, this rudimentary 2 party example is offered as an introductory example of the underlying concept. In practice, there will likely be many parties and many countries.

As a somewhat more complex example, a 3 party example would operate as follows. In this example, a new intermediary, BuyFX.com, is introduced. BuyFX.com operates the central computer system underlying the present invention.

Assume the following simple scenario, depicted in the table at Figure 1.0 below:

- Corporations: C<sup>1</sup>, C<sup>2</sup>, C<sup>3</sup>
- Corporation's Domestic Financial Institution: FI<sup>C1</sup>, FI<sup>C2</sup>, FI<sup>C3</sup>

- Corporation's Foreign Financial Institution:  $FI^{FC1}$ ,  $FI^{FC2}$ ,  $FI^{FC3}$
- BuyFX.com's Correspondent Banking Partners:  $FI^{BFX1}$ ,  $FI^{BFX2}$ ,  $FI^{BFX3}$
- $C^1$  - Owns GBP; Requires USD;
- $C^2$  - Owns USD; Requires YEN;
- 5      •  $C^3$  - Owns YEN; Requires GBP

In this example,  $C^1$  cannot satisfy its requirements in whole or in part by dealing with  $C^2$  exclusively. However, if  $C^3$  can be "linked" into the transaction, all three corporations can be satisfied to the value of the smallest available currency.

10      Therefore, in simple terms, if  $C^1$ 's USD requirement could be satisfied via  $C^2$ ,  $C^2$ 's YEN requirement via  $C^3$ ,  $C^3$ 's GBP requirement via  $C^1$ , you could reduce the number of participants in any leg of a transaction. That is, the various "cross border" elements of a transaction become nothing more than a series of netted domestic transactions.

15      Where previously there could be 18 or more participants over 3 transactions, there is now a maximum of 15, with a minimum of 9 (assuming distinct financial institutions in each jurisdiction).

The relationship and methodology to achieve this end is depicted in Figure 1.

The fundamental requirements for this system are:

20      A central computer system, networking participating financial institutions, which calculates transfer amounts and electronically instructs financial institutions in the area of funds direction. (FEDI)

A network of financial institutions (one or more), which has available to it the mathematical and communications software to relay customer instructions regarding the  
25      transfer of funds to a payee.

A central computer system, which uses batch file processing to execute recorded transactions and direct payments accordingly.

Referring to Figure 3, each party using the BuyFX.com system (i.e.  $C^1$ ,  $C^2$ , and  $C^3$ ) instructs its own domestic financial institution that it requires a foreign exchange  
30      payment to be made. That can be done in several ways; for example, each party could access a BuyFX.com web site and enter the details of the amount and the payee; it would

previously have entered into a mandate with BuyFX.com so that any instructions given by it in an authorised manner to the BuyFX.com web site triggers an automated debiting of cleared funds from that party's bank account into the BuyFX.com correspondent bank. Hence, when  $C^1$ , which banks in GBP, instructs its bank  $FI^{C^1}$  that it wishes a USD payment to be made to its US supplier, then, the equivalent amount in GBP is debited from the cleared funds in the account of  $C^1$  held at  $FI^{C^1}$  and transferred to  $FI^{BFX^1}$ . Generally, that will only occur after the Central System of BuyFX.com has determined that a match can be established which will led to a full or partial satisfaction of several parties payment obligations. That requires the Central System to monitor all foreign exchange requests, and, when it spots a match, to inform the BuyFX.com correspondent banks,  $FI^{BFX^1}$ ,  $FI^{BFX^2}$  etc, over the FEDI network. The BuyFX.com correspondent bank in a given jurisdiction then pulls payment from the payer's domestic financial institution and forwards it to the foreign financial institution acting for the party who wishes to make a payment to a payee in that same jurisdiction (e.g. in the case of GB in Figure 1, the payee in GB is  $C^3$ 's supplier, where  $C^3$  is based in Japan. Hence, the BuyFX.com correspondent bank in GB sends the GBP it has obtained from  $C^1$ 's bank money to  $C^3$ 's GB foreign financial institution,  $FI^{FC^3}$ , who then passes it to the GB payee in satisfaction of  $C^3$ 's debt to that payee.

Further detailed aspects of an implementation are contained in the following appendices, in which:

1. Appendix 1, which details the searching methodology and algorithm; and
2. Appendix 2, which details the transaction aging procedure and the order of operations; and
3. Appendix 3; which details the matching algorithm and netting (hybrid) procedure

## Appendix 1 – The Searching Methodology and Algorithm

1. Each currency is assigned a unique base ten exponential value henceforth known as an Assignment Value (AV) see Table 1.0 below. Example: GBP-AV 1.E+02
2. Source Currency Assignment Value (SCAV) e.g. SCAV for USD = 1.E+00
- 5 Beneficiary Currency Assignment Value (BCAV) e.g. BCAV for CAD = 1.E+01 see Glossary of Terms.

Table 1.0: Assignment Values

#	Currency	Values	Exponential
1	USD-AV	1	1.E+00
2	CAD-AV	10	1.E+01
3	GBP-AV	100	1.E+02
4	JPY-AV	1000	1.E+03
5	EUR-AV	10000	1.E+04
6	AUD-AV	100000	1.E+05
7	CHF-AV	1000000	1.E+06
8	ZAR-AV	10000000	1.E+07

- 10 3. To distinguish between currency combinations, one aggregates the assignment values of the underlying currencies. Example CAD/GBP/EUR = 10110. No other currency grouping can generate this assignment value. Each grouping has its own unique assignment value.
  4. Key to the process is that no combination of assignment values can be aggregated to equal the assignment value of any other currency. A base ten searching mechanism provides this characteristic.
  - 15 5. Using AVs from Table 1.0, one can generate matches mathematically. See Example 1.0.
  6. The searching mechanism has a finite number of combinations that can be easily defined by Formula 1.0.
  - 20 7. Formula 1.0: Total Combination Calculation
- $$T(n,x) = C(n,x) + C(n,x-1) + C(n,x-2) + \dots + C(n,2)$$

where C represents the number of combinations given n, the size of the universe and x, the number of elements in any one combination; x can be less than or equal to n and greater than or equal to 2.

8. Examples: Eight and Nine Currency Environments

5 Therefore, in an eight currency environment, the total number of combinations equals:

$$T(8,8) = C(8,8) + C(8,7) + C(8,6) + C(8,5) + C(8,4) + C(8,3) + C(8,2)$$

$$T(8,8) = 1 + 8 + 28 + 56 + 90 + 56 + 28$$

$$T(8,8) = 267 \text{ maximum combinations assuming we accept all possible links.}$$

10 In a nine currency environment, the total number of combinations equals:

$$T(9,9) = C(9,9) + C(9,8) + C(9,7) + C(9,6) + C(9,5) + C(9,4) + C(9,3) + C(9,2)$$

$$T(9,9) = 1 + 9 + 36 + 84 + 126 + 126 + 84 + 36$$

$$T(9,9) = 502 \text{ maximum combinations assuming we accept all possible links}$$

9. Note that the above equation is terminated at C(n,2) as two items at least are  
15 necessary to generate a match.

10. Note that the above equation can readily generate the number of available combinations should BuyFX.com wish to limit the matching procedure to any maximum number of participants. For example, BuyFX.com could have a 20 currency environment with a maximum of 6 participants to a transaction; mathematically the number of possible  
20 combinations to reflect these parameters can be described as:

$T(n,x) = C(n,x) + C(n,x-1) + \dots + C(n,2)$  where n is the number of available currencies and x is the maximum number of participants in any one transaction.

For a 20 currency environment, with a maximum of 6 participants to any one transaction:

25  $T(20:6) = C(20,6) + C(20,5) + C(20,4) + C(20,3) + C(20,2)$

$$T(20:6) = 38,760 + 15,504 + 4,845 + 1,140 + 190$$

$$T(20:6) 60439 \text{ possible combinations}$$

11. Source Currency Assignment Value (SCAV) is compared to the Beneficiary Currency Assignment Value (BCAV) to generate the match(es). Where the SCAV =  
30 BCAV for the same subset of clients, a match exists.

12. Example 1.0

**Numerical Example: Searching Methodology**

*Assumptions*

- 5 req'ts.
- a. Randomly entered data points denoting source and beneficiary currency
- b. All transactions entered at time  $t=1.0$ ; hence no transaction in the example has precedence based on time.
- c. Source Currency USD  
Beneficiary Currencies CAD CHF
- 10 d. Source Currency CAD  
Beneficiary Currencies JPY AUD
- e. Source Currency GBP  
Beneficiary Currencies USD EUR
- 15 f. Source Currency JPY  
Beneficiary Currencies GBP ZAR
- g. Source Currency EUR  
Beneficiary Currencies USD
- h. Source Currency AUD  
Beneficiary Currencies EUR
- 20 i. Source Currency CHF  
Beneficiary Currencies USD GBP ZAR
- j. Source Currency ZAR  
Beneficiary Currencies EUR



13. The above observations could be illustrated numerically as in Table 1.1

Table 1.1 Assumptions Denoted in Table Form with Corresponding Assignment Values

	USD	CAD	GBP	JPY	EUR	AUD	CHF	ZAR
<b>SCAV</b>	1.E+00	1.E+01	1.E+02	1.E+03	1.E+04	1.E+05	1.E+06	1.E+07
<b>BCAV</b>								
<b>USD</b>	1.E+00		1.E+00		1.E+00		1.E+00	
<b>CAD</b>	1.E+01	1.E+01						
<b>GBP</b>	1.E+02			1.E+02			1.E+02	
<b>JPY</b>	1.E+03	1.E+03						
<b>EUR</b>	1.E+04		1.E+04			1.E+04		1.E+04
<b>AUD</b>	1.E+05	1.E+05						
<b>CHF</b>	1.E+06	1.E+06						
<b>ZAR</b>	1.E+07			1.E+07			1.E+07	

5

14. AV Matches

Assumptions: In this example, all transactions aged identically at t=1

Assumptions: In this example, all transactions aged identically at t=1								
<b>Match 1</b>	1.E+01	1.E+05			1.E+00	1.E+04		
<b>SCAV</b>	110011	USD,CAD,EUR,AUD				<b>BCAV</b>		110011
<b>Match 2</b>	1.E+06					1.E+00		
<b>SCAV</b>	1000001	USD,CHF				<b>BCAV</b>		1000001
<b>Match 3</b>	1.E+01	1.E+03		1.E+00	1.E+02			
<b>SCAV</b>	1111	USD,CAD,GBP,JPY				<b>BCAV</b>		1111
<b>Match 4</b>	1.E+06				1.E+00		1.E+07	1.E+04
<b>SCAV</b>	11010001	USD,EUR,CHF,ZAR				<b>BCAV</b>		11010001

15. By comparing the aggregated assignment values of the source currencies against the beneficiary currencies, one can discover the matches. Where the values are identical, there is a match.

5 16. Mathematically, this is illustrated as follows:  $SCAV - BCAV = 0$  (Formula 1.1)

Matches: Denoted by source and beneficiary assignment values being equal.

a. Source Value 110011  
Beneficiary Value 110011  
Match: USD CAD EUR AUD

10

b. Source Value 1000001  
Beneficiary Value 1000001  
Match: USD CHF

15

c. Source Value 1111  
Beneficiary Value 1111  
Match: USD CAD GBP JPY

20

d. Source Value 11010001  
Beneficiary Value 11010001  
Match: USD EUR CHF ZAR

17. Since the subset of required assignment values is finite; the searching procedure is easily executable.

25 18. The system is easily scalable with the addition of currencies see #4 above. The maximum number of combinations is finite and can be defined. As this relates to CPU capacity, the requirements can be estimated with confidence.

## **Appendix 2 – Transaction Aging Procedure and Order of Operations**

1. While the Searching Algorithm provides a very clear methodology to exposing matches mathematically. Consideration must also be given to:

- 5           i.           the Transaction Aging Process
- ii.          the Order of Operations

2. The Transaction Aging Process is a time-based order management procedure through which entries are prioritized on a first in, first out basis, subject only to the parameters and limitations of either the BuyFX.com Transactions Rules or User Defined  
10 Parameters.

3. Order of Operations is a combination of Transaction Rules and User Defined Parameters, which necessitate unique treatment of the data entry in question. For example, if a customer tags the "All or none" order, the system must provide for this restriction by ensuring that the complete execution of the order can occur prior to  
15 engaging this entry in any transaction.

4. The Transaction Aging Process

- i.           Given that the user entry requires no special treatment in relation to the BuyFX.com Transactions Rules, and that the entry is not tagged with a user defined limitation, precedence of one entry over another is exclusively time based. In other  
20 words, the first entry into the system will, ceteris parabis, have priority over any subsequent entry.

5. Example 1.0

Table 1.0: Assignment Values

#	Currency	Values	Exponential
1	USD-AV	1	1.E+00
2	CAD-AV	10	1.E+01
3	GBP-AV	100	1.E+02
4	JPY-AV	1000	1.E+03

Randomly entered data points denoting the following transactions conditions:

At t=1.0; USD-SC; CAD-BC, therefore SCAV = 1, BCAV = 10

At t=1.1; EUR-SC; USD-BC, therefore SCAV = 100, BCAV = 1

At t=1.2; CAD-SC; EUR-BC, therefore SCAV = 10, BCAV = 100

At t=1.3; USD-SC; EUR-BC, therefore SCAV = 1, BCAV = 100

Where SC is Source Currency & BC is Beneficiary Currency

5 6. Transaction Aging Procedure

	SC	USD	CAD	EUR	JPY
	SCAV	1	10	100	1000
BC	BCAV				
USD	1			T=1.1; AV=1	
CAD	10	T=1.0; AV=10			
EUR	100	T=1.3; AV=100	T=1.2;AV=1		
JPY	1000		00		

7. AV Matches by Age

	I.	At T=1.0	No match	
	II.	At T=1.1	No match	
	III.	At T=1.2	Match	SCAV=BCAV=111
5	IV.	At T=1.3	Match	SCAV=BCAV=101

Notes:

- I. Match at T=1.3; if USD and EUR remaining in the queue after Match at  
 10 T=1.2.
- II. If USD or EUR supply exhausted at T=1.2, Match at T=1.3 will not occur.
- III. If observation at T=1.3 occurs prior to T=1.2; Match AV=101 will have  
 priority over Match AV=111. In this example Match AV=111 will not occur as one, of  
 either, USD or EUR would be exhausted.
- 15 8. The Factors Influencing the Order of Operations
  - Time Stamp - per Aging Rules above
  - Size - parceling if necessary to ensure customer fulfillment and prevent  
 "monopolization" by any one customer.
  - Type of Transaction - Match; Match and Market, Match (All or None), Market,
  - 20 Special Liquidity
    - User Defined Parameters - price limits, duration, etc.

### Appendix 3 – The Matching Algorithm

1. By combining the BuyFX.com Searching Algorithm with the Transactions Aging Procedure, AV Matches can be discovered. (see BuyFX Searching Algorithm and BuyFX Transaction Aging Methodology & Order of Operations)

2. When an AV Match is discovered via the BuyFX Searching Algorithm, at least two clients will be party to the transaction. The limiting factor to the transaction will, therefore, be the least supply of currency (or the smallest Source Currency Quantity or SCQq) among the parties to the transaction. eg. Assume AV Match = 101 (GBP and USD); one client has 100,000 USD for GBP and another has 100,000 GBP for USD; USD/GBP = .62225: the limiting factor to this transaction is the SCQq of 100,000 USD. Therefore, the client with SC=USD and BC=GBP will receive all of his desired GBP and drop from the queue. All other parties will remain in the queue subject to user parameters and transaction rules.

3. To calculate the amount of currency allocated to each of the parties in a transaction:

A. Each supply of currency is denoted in a common or base currency equivalent form. Since USD is the global standard against which all currencies are typically quoted, USD will be used as the base currency for these calculations. Formula

1.0 describes a currency in terms of the base currency, in this case, USD.

Formula 1.0:

$Q^{USD}(\text{SC in Base terms}) = \text{SCQ} / \text{SC FX Rate as against the Base Currency}$

or  $Q^{USD} = \text{SCQ} / R^{USD/SC}$

Example: To calculate JPY in USD terms,  $R=109.45$ ,  $\text{SCQ}=109,450$  JPY

$Q^{USD} = \text{SCQ}^{JPY} / R^{USD/JPY}$

$Q^{USD} = 109,450 / 109.45 = 1000$  USD

Therefore, at time t, 109,450 JPY was equal to 1000 USD.

B. The SCQq is determined, thereby defining the limiting source and quantity of currency against which the other participant volumes can be calculated. Each party to the transaction will undergo the calculation denoted in Formula 1.1 to determine the supply of currency, which that particular client will contribute to the transaction ( $SCQ^T$ )

5 Formula 1.1:

$SCQ^T$  (quantity supplied to the transaction) =  $SCQq \times \text{Source FX Rate as against the Base Currency}$

$$\text{or } SCQ^T = SCQq \times R^{\text{USD/SC}}$$

Example: To calculate the volume of source currency contributed to a transaction.

10 If the  $SCQq = 10 \text{ USD}$ , and  $R^{\text{USD/GBP}} = 0.62225$ ,

$$SCQ^{\text{TGBP}} = 10 \times 0.62225 = 6.2225 \text{ GBP}$$

Therefore, the client with  $SC=\text{GBP}$  would supply 6.2225 Pounds to this transaction and the client with  $BC=\text{GBP}$  would receive 6.2225 Pounds as a party to this transaction.

15 4. Consider the following example:

- Client B has 15 CAD as Source Currency Quantity (SCQ) and requires  $X$  JPY as Beneficiary Currency Quantity (BCQ)
- Client H has 3000 JPY as Source Currency Quantity (SCQ) and requires  $Y$  CAD as Beneficiary Currency Quantity (BCQ)

20 The prevailing foreign exchange rates are noted in the Table below:

**Sample  
Transaction**

Client	SCQ	FX Rate	SCQ (in USD)		BC	Residual $SCQ^R$
		(see Table 7.1)	Formula 1.0	BCQ		
B	15	1.45425	10.31	1128.93 JPY		0
H	3000	109.45	27.41	15.00 CAD		1871.068

$SCQq = 10.31 \text{ USD}$

Therefore,

Applying the calculation

$$SCQ^T = SCQ_q \times R^{USD/SC}$$

5 Client B:

$$SCQ^{T\text{ CAD}} = 10.31 \times 1.45425 = 15 \text{ CAD (therefore "B" provides 15 CAD to "H")}$$

$$BCQ^{T\text{ JPY}} = 1128.93 \text{ JPY}$$

Client H:

10  $SCQ^{T\text{ JPY}} = 10.31 \times 109.45 = 1,128.93 \text{ JPY (therefore "H" provides 1,128.93 JPY to "B")}$

$$BCQ^{T\text{ CAD}} = 15 \text{ CAD}$$

Client B, holding the smaller USD equivalent position, can be executed in its entirety; 1128.932 JPY for 15 CAD.

15 Client H receives 15 CAD and remains in the queue having available 1871.068 JPY for the next counterparty.

5. To calculate the residual source funds  $SCQ^R$  for the next applicable transaction, one need only subtract the  $SCQ^T$  (the quantity supplied to the transaction) from the  
20 original SCQ.

Formula 1.3:

$$SCQ^R = SCQ - SCQ^T$$

25

Example: To calculate the volume of source currency remaining after a transaction.

If the  $SCQ = 3000 \text{ JPY}$ , and  $SCQ^{T\text{ JPY}} = 1128.93$

$$SCQ^{R\text{ JPY}} = 3000 - 1128.93 = 1871.07 \text{ JPY}$$

30



Therefore, the client with SC=JPY would be ready to supply at most, 1871.07 JPY to the next transaction.

6. A. All details of the transaction will be stored to a database for aggregation &  
 5 “batch payment and settlement”

B. As currencies fluctuate against the USD, calculations will be generated from live data to supply the client with “real-time” competitive pricing.

7. Applying the BuyFX Algorithms and Procedures

7.1 Sample Foreign Exchange Rate Table

10

Mid Point FX Rates		
Currency	Quotation	Mid-Point
R USD/CAD	1.45375/475	1.45425
R USD/GBP	0.6220/25	0.62225
R USD/JPY	109.40/50	109.45
R USD/EUR	0.9860/65	0.98625
R USD/AUD	1.5830/40	1.5835
R USD/CHF	1.6270/75	1.62725
R USD/ZAR	6.3260/70	6.3265

Quotations as at 02/16/00

Note: Currency rates are dynamically reflected in the calculations in USD terms at any time T=match. The rates above are merely a static sampling for the purposes of this example.

15

20

7.2 Sample Currency Assignment Values

#	Currency	Values	Exponential
1	USD-AV	1	1.E+00
2	CAD-AV	10	1.E+01
3	GBP-AV	100	1.E+02
4	JPY-AV	1000	1.E+03
5	EUR-AV	10000	1.E+04
6	AUD-AV	100000	1.E+05
7	CHF-AV	1000000	1.E+06
8	ZAR-AV	10000000	1.E+07

7.3 Random Currency Entries using Tables 7.2

	SC	BC	SC-AV	BC-AV	SCQ
T=1.0	GBP	USD	100	1	20
T=1.1	CAD	JPY	10	1000	15
T=1.2	GBP	CAD	100	10	10
T=1.3	JPY	USD	1000	1	800
T=1.4	AUD	USD	100000	1	30
T=1.5	USD	EUR	1	10000	35
T=1.6	CAD	ZAR	10	10000000	15
T=1.7	JPY	CAD	1000	10	3000
T=1.8	EUR	GBP	10000	100	30
T=1.9	CAD	JPY	10	1000	40
T=2.0	EUR	CHF	10000	1000000	25
T=2.1	ZAR	GBP	10000000	100	110
T=2.2	CAD	AUD	10	100000	19.5
T=2.3	USD	GBP	1	100	30

Where SC/BC is Source/Beneficiary Currency; AV is Assignment Value; Q is Quantity

#### 7.4 Sample Initial SCQs and AV Matches

Time	Client	SCAV	BCAV	AV-Match	Initial SCQ	Initial Q <sup>USD</sup>
T=1.0	A	100	1	N/A	20	32.14
T=1.1	B	10	1000	N/A	15	10.31
T=1.2	C	100	10	N/A	10	16.07
T=1.3	D	1000	1	N/A	800	7.31
T=1.4	E	100000	1	N/A	30	18.95
T=1.5	F	1	10000	N/A	35	35.00
T=1.6	G	10	10000000	N/A	15	10.31
T=1.7	H	1000	10	1010	3000	27.41
T=1.8	I	10000	100	10101	30	30.42
T=1.9	J	10	1000	1010	40	27.51
T=2.0	K	10000	1000000	N/A	25	25.35
T=2.1	L	10000000	100	10000110	110	17.39
T=2.2	M	10	100000	N/A	19.5	13.41
T=2.3	N	1	100	101	30	30.00
T=2.3				100111		

The results of each subsequent client entry are recorded in 7.5 below.

7.5 Results of Sample Currency Entries

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
A	T=1.7	B (T=1.1)	15.0 CAD	0 CAD	Client B receives 1128.93244 JPY
				1871.068	
		H (T=1.7)	3000 JPY	JPY	Client H receives 15.0 CAD
		<i>Client B requirement is executed in its entirety and Client B is removed from the queue.</i>			
		<i>Client H requirement is partially executed and Client H remains in the queue.</i>			

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
B	T=1.8	I (T=1.8)	30 EUR	0 EUR	Client I receives 18.92776 GBP
				1.07224	
		A (T=1.0)	20 GBP	GBP	Client A receives 30.41825 USD
				4.58175	
		F (T=1.5)	35 USD	USD	Client F receives 30 EUR
		<i>Client I requirement is executed in its entirety and Client I is removed from the queue.</i>			
		<i>Client A requirement is partially executed and Client A remains in the queue.</i>			
		<i>Client F requirement is partially executed and Client F remains in the queue.</i>			

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
C	T=1.9	H (T=1.7)	1871.068 JPY	0 JPY	Client H receives 24.86067 CAD
				15.13933	
		J (T=1.9)	40 CAD	CAD	Client J receives 1871.068 JPY
		<i>Client H requirement is executed in its entirety; Client H is removed from the queue.</i>			
		<i>Client J requirement is partially executed and Client J remains in the queue.</i>			
	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
D	T=2.1	G (T=1.6)	15 CAD	0 CAD	Client G receives 65.25529 ZAR
				44.74471	
		L (T=2.1)	110 ZAR	ZAR	Client L receives 6.41826 GBP
				3.58174	
		C (T=1.3)	10 GBP	GBP	Client C receives 15.0 CAD
		<i>Client G requirement is executed in its entirety and Client G is removed from the queue.</i>			
		<i>Client L requirement is partially executed and Client L remains in the queue.</i>			
		<i>Client C requirement is partially executed and Client C remains in the queue.</i>			

**E**

**Using Transaction Aging Rules, Transaction E has priority over Transaction F.**

Time	Client	Initial Position	SCQ <sup>R</sup>	Description
T=2.3	A (T=1.0)	1.07224 GBP	0 GBP	Client A receives 1.72317 USD
			28.27683	
	N (T=2.3)	30 USD	USD	Client N receives 1.07224 GBP

*Client A requirement is executed in its entirety and Client A is removed from the queue.*

*Client N requirement is partially executed and Client N remains in the queue.*

**F**

Time	Client	Initial Position	SCQ <sup>R</sup>	Description
T=2.3	C (T=1.2)	3.58174 GBP	0 GBP	Client C receives 8.37083 CAD
			11.12917	
	M (T=2.2)	19.5 CAD	CAD	Client M receives 9.11481 AUD
			20.88519	
	E (T=1.4)	30 AUD	AUD	Client E receives 5.75612 USD
			22.52071	
	N (T=2.3)	28.27683 USD	USD	Client N receives 3.58174 GBP

*Client C requirement is executed in its entirety and Client C is removed from the queue.*

*Client M requirement is partially executed and Client M remains in the queue.*

*Client E requirement is partially executed and Client E remains in the queue.*

*Client N requirement is partially executed and Client N remains in the queue.*

8. Sample Client Positions (after 14 observations)

Client	SCQ	SC	BC	Net BCQ (A)	SCQ <sup>R USD</sup>	%B/A
A	20	GBP	USD	32.14	0.00	0.00%
B	15	CAD	JPY	1128.93	0.00	0.00%
C	10	GBP	CAD	23.37	0.00	0.00%
D	800	JPY	USD	0.00	7.31	100.00%
E	30	AUD	USD	5.76	13.19	69.62%
F	35	USD	EUR	30.00	4.52	13.09%
G	15	CAD	ZAR	65.26	0.00	0.00%
H	3000	JPY	CAD	39.86	0.00	0.00%
I	30	EUR	GBP	18.93	0.00	0.00%
J	40	CAD	JPY	1871.07	1139.42	37.85%
K	25	EUR	CHF	0.00	41.25	100.00%
L	110	ZAR	GBP	6.42	4.40	40.68%
M	19.5	CAD	AUD	9.11	12.12	57.07%
N	30	USD	GBP	4.65	14.01	75.07%

Note: %B/A is the percentage of currency which is, as yet, unfilled after 14 observations.

9. Summary of Results

Client	Initial Req't (in USD)	Value Executed (in USD)	% Executed
A	32.14	32.14	100%
B	10.31	10.31	100%
C	16.07	16.07	100%
D	7.31	0.00	0%
E	18.95	5.76	30%
F	35.00	30.42	87%
G	10.31	10.31	100%
H	27.41	27.41	100%
I	30.42	30.42	100%
J	27.51	17.10	62%
K	25.35	0.00	0%
L	17.39	10.31	59%
M	13.41	5.76	43%
N	30.00	7.48	25%
<b>Totals</b>	<b>301.57</b>	<b>203.49</b>	<b>67%</b>

10. Observations from Table 8.0

<b>A</b>	Percentage of Transactions executed fully	43%
<b>B</b>	Percentage of Transactions executed partially	43%
<b>C</b>	Percentage of Remaining Transactions	14%
<b>D</b>	Initial USD equivalent value in queue	301.57
<b>E</b>	Value of USD equivalent Matched	203.49
<b>F</b>	Percentage of Value Matched	67%



## 11. Glossary of Terms

**SC Source Currency** - the available currency i.e. the currency to be converted

**BC Beneficiary Currency** - the desired or destination currency i.e. the currency into  
5 which the source funds will be converted

**AV Assignment Value** - an identifier used to distinguish one currency from another  
eg. GBPAV= 1.E+02; AVs are used to source matches between clients (see Searching  
Algorithm). Currency pairs or multiples have unique AV totals (see Table 7.2); for  
example, a pairing of CAD & GBP is identified by 110; GBP & USD by 101; CAD &  
10 JPY by 1010 etc.

**SCAV Source Currency Assignment Value** - the value assigned to the source currency  
of a client transaction e.g. if client has GBP for conversion to CAD, SC = GBP, therefore  
SCAV =GBPAV= 1.E+02 (see Table 7.2)

**BCAV Beneficiary Currency Assignment Value** - the value assigned to the beneficiary  
15 currency of a client transaction e.g. if client has GBP for conversion to CAD, BC = CAD,  
therefore BCAV =CADA V= 1.E+01 (see Table 7.2)

**AV Match Assignment Value Match** - by definition, a match occurs when the Source  
Currency AV of two or more parties is equal to the Beneficiary Currency AV of those  
same parties; SCAV=BCAV or SCAV-BCAV=0 eg. If one client has GBP to convert to  
20 CAD and another client has CAD to convert to GBP,

$$SCAV = GBPAV + CADA V = 110 = BCAV = GBPAV + CADA V$$

**SCQ Source Currency Quantity** - the amount of source currency to be converted

**BCQ Beneficiary Currency Quantity** - the amount of beneficiary currency available  
post-transaction(s)

25 **Q<sup>USD</sup>** Represents a Source Currency in USD equivalent terms; used to compare the  
SCQs of the participants in a transaction to discover the SCQq (see below)

**R Foreign Exchange Rate** - the amount of one currency required to procure another  
eg. If 109.45 JPY = 1 USD; R = USD/JPY = 109.45

**SCQq** Represents the limiting factor to a transaction, the SCQq is the smallest SCQ (or  
30 SCQ<sup>R</sup>), as denoted in USD terms, from the participants to a transaction.

**SCQ<sup>T</sup>** Represents the quantity of currency contributed by a client in executing a transaction.

$$SCQ^T = SCQ_q \times R^{USD/SC}$$

**SCQ<sup>R</sup>** Represents the residual currency post-transaction available in the queue for future  
5 matches.

$$SCQ^R = SCQ - SCQ^T$$

**Queue** All of the SCQ'S available for transactions, prioritized by system transaction rules and user-defined parameters.

**WE CLAIM**

1. A method of multi-currency funds settlement comprising the following steps:

funds in a currency X of a first legal person who is situated in country X<sup>1</sup> are transferred in whole or part within country X<sup>1</sup> to satisfy in whole or part the currency X<sup>1</sup> payment obligations of a second legal person, situated in a different country Y<sup>1</sup>;

and the funds in a currency Y of that second legal person situated in country Y<sup>1</sup> are transferred in whole or part within country Y<sup>1</sup> to satisfy in whole or part the currency Y payment obligations of a legal person, who may be the first legal person or one or more different or additional legal persons.

2. The method of multi-currency funds settlement as defined in Claim 1 in which each legal person seeking to transfer foreign currency enters into a computer program an amount of foreign currency required and an applicable payee.

3. The method of Claim 2 in which the computer program is hosted on one or more web servers.

4. The method of any preceding claim in which funds which are transferred to a payee in a given jurisdiction are generated from a series of debits and credits passing back to a debit of cleared funds of a bank account held by a legal person in that same jurisdiction, that legal person not seeking to transfer funds to that payee but to a payee in a different jurisdiction.

5. A computer program receiving data defining the non-domestic payment obligations of parties located in two or more countries, and programmed to identify opportunities to satisfy those non-domestic payment obligations by assigning payment obligations using the funds settlement method defined in Claim 1 - 4.

6. A computer server programmed with the computer program of Claim 5.

7. A computer terminal acting as a client, in which the client accepts from a party a foreign exchange requirement and sends that requirement to a server as defined in Claim 6.

5 8. A computer based system which enables parties located in two or more jurisdictions to meet their foreign currency payment obligations, comprising a first computer terminal into which a party located in a first jurisdiction inputs details of a potential first foreign currency financial transaction, a second computer terminal into which a second party located in a second jurisdiction inputs details of a potential second  
10 financial transaction, a computer network connecting the first and second terminals; characterized in there being a computer program arranged to determine if any transfer of funds from the first party to a payee located in the first jurisdiction satisfies in whole or part the requirement of the second party to transfer funds to that payee.

15 9. The computer based system of Claim 8 in which there are numerous computer terminals in numerous countries and the computer program is arranged to determine if any transfer of funds from a party to a payee located in the jurisdiction of that party satisfies in whole or part the requirement of another party to transfer funds to that payee.

## **ABSTRACT**

5           Cross border multi-currency payment obligations are met not with conventional  
complex and expensive FX transactions, but instead with legal persons (typically  
corporations) in different countries in effect assigning payment obligations so that funds  
of a party in one country remain in that country and are used to meet the payment  
obligations in that country of a party outside of that country.

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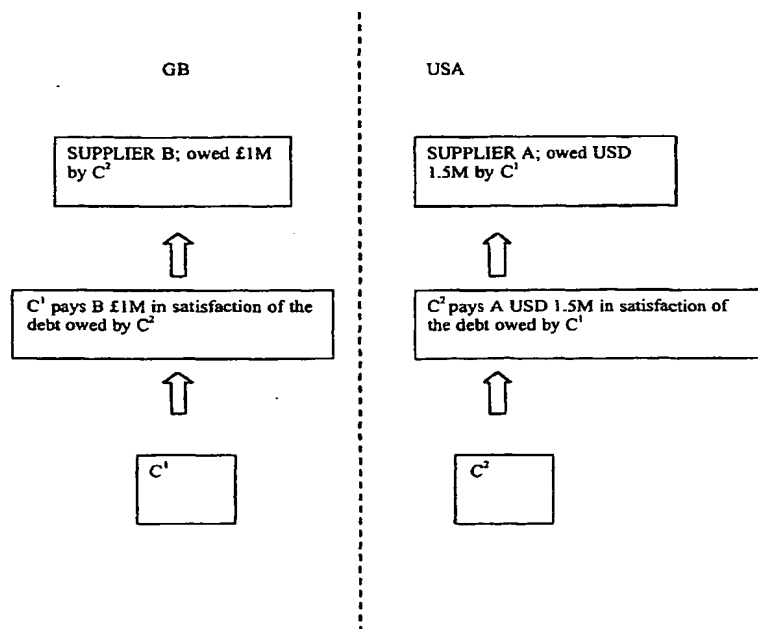
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(54) Title: **METHOD AND APPARATUS FOR MULTI-CURRENCY FUNDS SETTLEMENT**



(57) Abstract: Cross border multi-currency payment obligations are met not with conventional complex and expensive FX transactions, but instead with legal persons (typically corporations) in different countries in effect assigning payment obligations so that funds of a party in one country remain in that country and are used to meet the payment obligations in that country of a party outside of that country.

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## Method and apparatus for multi-currency funds settlement

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### Field of the Invention

The present invention relates to a method of and apparatus for multi-currency funds settlement.

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### Description of the Prior Art

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The Internet offers the promise of allowing buyers and sellers of goods and services to communicate directly with one another, eliminating the need for some of the intermediaries and the associated economic inefficiencies present in conventional selling. Hence, for example, it is in 1999 possible to transact many kinds of business using the Internet, which formerly would have required a broker or agent. Examples include the purchase of insurance, airline tickets, books and holidays.

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The Internet also enables new models of buying and selling as well: for example, there are now many Internet auction sites, on which a wide range of goods and services are auctioned to the highest bidder, with the seller merely setting a reserve price or a bid start price. The terms to 'buy' and 'sell' and related expressions should be broadly construed to include any kind of transfer of rights or interests; 'buyers' and 'sellers' should be also broadly construed to include any transferee and transferor of any kind of right or interest. The terms 'party' and 'counterparty' are commonly used to describe a situation in which a given party is both a buyer and simultaneously a seller. This can arise, for example, where a party wishes to exchange US\$100 for the equivalent in Sterling. That party is simultaneously a seller of US\$ and a buyer of Sterling.

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Computer systems linking many potential buyers and sellers of goods and services over an extensive computer network also existed prior to the widespread adoption of

the Internet, particularly in the financial services sector. One example is the foreign exchange dealing systems developed and run by organisations such as Reuters plc and the EBS Partnership. In these systems, banks post the prices at which they are willing to buy or sell defined quantities of currencies. The systems may automatically spot matches – i.e. where a buyer is willing to buy at a price at which a seller is willing to sell – and complete the trade. If a potential buyer of currency can find no-one willing to sell at a price it considers low enough, then typically, that potential buyer will simply have to either wait for the pricing in the market to become more favourable, or else be prepared to pay more. Such systems are commonly used for currency speculation, namely taking a trading position with respect to one or more given currencies to exploit favourable pricing movements.

Where a buyer and seller regularly trade with one another, it is normal to aggregate all transactions over a defined period of time and for just a single net payment to be made. Hence, for example, if party A buys 50 units at \$1 from party B over a week, and counterparty B buys 20 units at \$1 from party A over that same week, then the respective payment obligations can be netted off so that A pays \$30 to B at the end of the week. This same principle applies to the more sophisticated environment of trading foreign exchange and other financial property. Where more than a single party and counter-party pair are involved, for example, a 3 way group or even higher orders, multilateral netting can be applied.

Netting systems should minimize the number of intra and inter company receipts and payments, which incur float costs in the banking system. Netting reduces the total payments (cost and credit structure improvement), the number of transactions (cost and system architecture improvement), and often, the risk in a transaction system (credit structure improvement). To illustrate this concept, if UKCorp1 owes UKCorp2 100 Pounds Sterling and UKCorp2 owes UKCorp3 100 Pounds Sterling, then UKCorp1 could pay UKCorp3 100 Pounds directly thereby reducing the payments from 200 Pounds total to 100 Pounds, and the number of transactions from 2 to 1.



In addition to the need for speculative currency trading, there exists also a very substantial need for corporations to buy and sell foreign currency, for example, to pay overseas suppliers. Similarly, individuals travelling abroad or making foreign investments need to obtain foreign currencies as well. Currently, corporations and individuals will approach a bank or foreign currency vendor (such as American Express Inc.) to obtain foreign currency. The bank or foreign currency vendor will in turn often have obtained its stocks of foreign currency from other banks, in many cases having used an inter-bank trading system such as the Reuters or EBS systems. Because of the chain of intermediaries, the transaction cost of buying or selling foreign exchange in this way is quite high: this is reflected in the commission charged and the difference between the bid and the offer prices: a bank will typically sell foreign currency at a rate considerably higher than the rate at which it will buy it back. For small transactions, the difference can be 4%. For larger transactions, the difference is typically 5 basis points.

The mechanics of cross border payments is quite complex. For example, take the situation, where a company C in the US, with US dollars in a US account, wishes to pay a supplier in England in Sterling. Assume also that company C has to pay a supplier in Sterling but has no Sterling receivables to do so. The typical procedure, required for this transaction to be completed using a wire transfer process is as follows:

A. Funds are debited from C's US home bank account immediately on direction to wire transfer and the US dollar funds credited to the US home bank, typically in a general account. A wire transfer is therefore in respect of "final or cleared funds". Depending on the nature of the transfer, a foreign exchange component may be completed between the originator and his financial institution.

5 B. In most cases, the wire transfer direction to pay is a "push driven" process, in which funds are directed to the international clearing banks (originating and/or receiving) via SWIFT or a network of correspondent financial institutions. In the case of Company C's funds, the US Dollars now resident in a general account of C's home bank are credited to the account of the correspondent or network bank and the chain of correspondent debits and credits begins until the funds are credited to the ultimate beneficiary account. The "direct clearer" or correspondent bank in the receiving country is ultimately responsible to push the funds to the receiving bank, who subsequently directs the funds to the beneficiary. The domestic component of the wire transfer typically occurs via the domestic payment system. It is common for each country to have multiple international clearing banks that have correspondent relationships with international clearing banks in other countries and that operate domestically with the payment system. Examples include Barclays Bank, Toronto Dominion Bank, Chase Manhattan Bank, The US Federal Reserve.

15 C. In the case of a US Dollar to Sterling wire transfer, the UK clearer transfers the funds from the US bank's "GBP nostro" account (either the home bank if it has a nostro account or the correspondent US bank having a nostro account) to the account with the UK correspondent bank and then to the bank of the wire transfer receiver (if they are not the same) through the UK domestic payment system. Hence C has met its obligation in the UK. A US FI's GBP nostro is a bank account held at a GB FI in the name of the US FI but holding the currency of the foreign jurisdiction, in this case GBP.

25 This process is relatively expensive and involves numerous participants: Two international clearers, one per country, typically two correspondent banks having nostro accounts with each other, two home banks one each for receiver and originator, and two transactors, an originator and a receiver. Further to that, a push driven system is open to processing delays as financial institutions seek to maximize the use

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of available funds as part of their overnight float and hence only move the funds when absolutely necessary.

## 5 Summary of the Invention

In accordance with a first aspect of the invention, the method of multi-currency funds settlement comprises the following steps:

10 funds in a currency X of a first legal person who is situated in country X<sup>1</sup> are transferred in whole or part within country X<sup>1</sup> to satisfy in whole or part the currency X<sup>1</sup> payment obligations of a second legal person, situated in a different country Y<sup>1</sup>;

15 and the funds in a currency Y of that second legal person situated in country Y<sup>1</sup> are transferred in whole or part within country Y<sup>1</sup> to satisfy in whole or part the currency Y payment obligations of a legal person, who may be the first legal person or one or more different or additional legal persons.

20 Hence, the essential principle is for cross border multi-currency payment obligations to be met not with conventional complex and expensive FX transactions, but instead with legal persons (typically corporations) in different countries in effect assigning, novating, swapping or otherwise altering payment obligations so that funds of a party in one country remain in that country and are used to meet the payment obligations in that country of a party outside of that country. The term 'assigning' will be used in this specification to cover any such kind of alteration of payment obligations and is  
25 not limited to a legal or equitable assignment as such.

30 Clearly, full settlement of payment obligations is unlikely to occur where the total system involves only 2 parties and 2 countries, although this too is possible if both parties have corresponding bank accounts in both of the relevant jurisdictions (4 accounts total). The practical realisation of the present invention therefore likely occurs in multi-party, multi country situations, where, given sufficient fund volumes

and diversity, all or virtually all payment obligations can be fully satisfied. With sufficient fund diversity and volumes, most if not all multi-currency cross border settlements can be satisfied using solely domestic transactions: only the residual elements left over after all domestic transactions have been netted off require genuine cross-border settlement. This inherently operates as a risk reduction mechanism as the bank never takes a principal position, but rather acts solely as a custodian. It further reduces the amount that can ever be in dispute by only ever using precleared funds of the various participants. Therefore in the event of a problem which requires transaction unwinding, the most at risk for any party is the gain or loss associated with the interim movement in exchange rates between the relevant currencies.

In a second aspect, there is a computer program receiving data defining the non-domestic payment obligations of parties located in two or more countries, and programmed to identify opportunities to satisfy those non-domestic payment obligations by assigning payment obligations using the funds settlement method defined above.

A third aspect of the invention is a computer server programmed with the computer program of the second aspect.

A fourth aspect is a computer terminal acting as a client, in which the client accepts from a party a foreign exchange requirement and sends that requirement to a server as defined in the third aspect.

A fifth aspect is a computer based system which enables parties located in two or more jurisdictions to meet their foreign currency payment obligations, comprising a first computer terminal into which a party located in a first jurisdiction inputs details of a potential first foreign currency financial transaction, a second computer terminal into which a second party located in a second jurisdiction inputs details of a potential second financial transaction, a computer network connecting the first and second

terminals; characterised in there being a computer program arranged to determine if any transfer of funds from the first party to a payee located in the first jurisdiction satisfies in whole or part the requirement of the second party to transfer funds to that payee. Instead of a merely bi-lateral system, in a practical implementation there may be numerous computer terminals in numerous countries and the computer program is then arranged to determine if any transfer of funds from a party to a payee located in the jurisdiction of that party satisfies in whole or part the requirement of another party to transfer funds to that payee.

The present invention utilises and exploits a special aspect of currency dealing, namely that the currency of any country does not, typically, ever leave that country. That is to say, for example, a US dollar account in Canada is merely a Canadian dollar account with a conversion factor to a US dollar equivalent.

The present invention utilises a computer-based system to restructure the method of payment and settlement to reduce the number of participants, thereby streamlining the procedure and improving efficiency.

## Brief Description of the Drawings

The invention will be described in more detail with reference to:

Figure 1 which is a diagram representing the bid/offer pricing for USD priced in CAD;

Figures 2A, 2B and 2C which is a table showing how a FX netting 'hybrid' system can operate;

Figures 3A and 3B, which are schematic depictions of a computer based system which enables buyers and sellers of foreign exchange to be efficiently matched; and

Figure 4, which is a schematic representing the key steps in the system as applied to FX matching; and

Figure 5, which illustrates the mechanics and benefits of transactions netting

Figure 6 which is simplified schematic showing the principle of the payment approach of the present invention

Figure 7 which is a table relating to an example of a series of payments made using the present invention and

Figure 8 which is a schematic of the computer system for implementing international payments as defined in the present invention.

### Detailed Description

The present invention will be described with reference to various examples, as illustrated in the attached Figures.

Currently, banks broker foreign exchange transactions, providing an intermediary to purchase and sell currency for both theirs' and their clients' accounts. For each transaction the bank garners the "spread", typically 5 basis points on large transactions and up to 4% on smaller transactions.

In the present invention, the appropriate underlying transactional software allows one end user of the foreign exchange (e.g. a first corporation, Corporation A, doing a cross border procurement) to liaise directly or indirectly with a counterparty, a second corporation, Corporation B, which requires the home currency of Corporation A. The bank brokering function, as it pertains to the financial instrument itself, can be reshaped; that is, the spread currently absorbed by the two sample corporations could be reduced or negated. Each party might therefore improve its cash position by one half the value of the spread that they would incur, for example on a 5 basis points

spread, the corporation would improve its position by 2.5 basis points. For smaller customers the savings on a percentage basis would be substantially greater.

Moreover, transactions could be executed in a multitude of dimensions: two way; three way; four way; etc, since the software would expose the transactional opportunities available to each of the clients. (This process is described in more detail in Appendices 1 & 3)

The overall system approach can best be understood through a sample problem:

#### Sample problem

Imagine the following:

1. That the spot price of CDNS is US\$ 1.5363 - 1.5373 at November 27/98.
2. That Corporation A is buying US \$1M to purchase equipment at a cost of CDN \$1,537,300.00. Corporation A. has CDN \$1,536,800.00 on account with a bank for the transaction (note: this assumes that the bank provides the best rate to Corporation A).
3. That Corporation B has US\$1M on account with the bank but requires CDNS1,536,300.00 to purchase raw materials.

If the bank matches its own funds to supply Corporation A with US\$1M and Corporation B with CDNS1,536,300.00, then it makes a profit of \$1,000.00 per \$million transacted. Although \$1,000 is a very small amount in the context of a significant \$1M transaction, the total global volume of such transactions is extremely large, so that the cumulative profits to banks are very substantial.

In the present invention, the following occurs: Corporation A and B agree before transacting that they will do so at an exchange rate that is the mid-point of the posted Interbank rate, for example, the Interbank highest bid, lowest offer at the appropriate time. This is a fair compromise for each participant. Hence, the transaction can be

completed automatically, rapidly and efficiently. The party and counterparty each deposit the funds needed to execute a transaction with a financial institution; the funds are preferably pre-cleared and are not marginable through the system. A sophisticated computer program determines that the party and counter-party are taking reciprocal positions, which can be matched against each other and instructs the relevant financial institutions to transfer the required foreign exchange as, in effect, a swap. By matching Corporation A with Corporation B, each of their positions is improved by \$500.00 per million, less a transaction fee to an intermediary of perhaps \$50.00 per side. The result is that Corporation A receives US\$1M for \$1,536,750 per million; a saving of \$450.00 per million; Corporation B Receives \$1,536,850 for US\$1M; an improvement in profit of \$450.00. The system has in effect reduced the spread to 1 basis point. The spread can theoretically be reduced to just short of zero since the present invention operates efficiently and automatically. This example works because of the exactly matching reciprocal requirements of the parties. In practice, that will rarely happen and some sort of netting will be required.

The fundamental netting concept applied in this embodiment is that a computer is programmed with information relating to a party and counterparty transaction, to determine a net payment position if both the first and second transactions were to occur and to actually complete each transaction on the basis of the net payment position.

This approach can be contrasted with conventional netting, in which a transaction is completed and only subsequently does netting occur to reduce the number and size of payments. Typically, there might be several party/counterparty pairs in a connected series of transactions in the present embodiment.

#### **Multilateral Netting Example**

In the present system, it will be seen that the netting step is not simply a stage subsequent to but independent from the underlying exchange transaction, performed



for accounting simplicity to reduce the numbers and sizes of cross-payments. Instead, it is an integral part of the underlying exchange transaction between party and counterparty. This is most clearly emphasised when considering a multi-party exchange of currencies. Take, for example, a situation in which there are 3 Corporations - A, B and C. A has CAD and needs JPY; B has JPY and needs USD; C has USD and needs CAD. The exact needs are shown in Figure 2A. A cannot satisfy its requirements in whole or in part by dealing with B exclusively. However, if C can be "linked" into the transaction, all three corporations can be satisfied to the value of the smallest available currency. (A more detailed example with multiple parties and jurisdictions is available for review in Appendices 1, 2, and 3).

We assume that the mid-point of Interbank B/O at a point in time is as follows: 1.53675 CAD; 1 USD; 88.7755 YEN; (i.e. all numbers are relative to the USD base currency).

The desired amounts indicated on Figure 2A reflect the mid-market value of the available currency. The post-match situation using this embodiment is shown on Figure 2B.

It will be noted that the limiting factor in this match example was the availability of CAD for JPY.

The embodiment uses a "currency link" to match partially or fully the desired quantities of the match. A currency link is created using the source currency and the beneficiary (desired) currency for a series of transactions. Figure 2C illustrates a simple three-way currency link.

Note, that if, for example, Party C wanted a currency other than AAA, say DDD, there would not be a currency link from which to synthesize a transaction.

A link is therefore defined as (A to B; B to A); or (A to B; B to C; C to A); or (A to B; B to C; C to D; D to A) etc. A mathematical relationship at a point in time therefore exists between the currencies. Another example is A to C, B to A and C to B.

5 The distinction from traditional netting programs is three-fold. First, netting in the present embodiment happens in "real-time", not at a fixed point in time post transaction for various parties, none of which are necessarily the same from one "link" to the next, and consequently, from one "match" (whole or partial) to the next. Second, the program is designed to seek out the "currency linking" through a  
10 combination of user defined parameters and system transaction rules. As complete matches occur (as in A above), the matched party drops out of the matrix or queue. The program seeks out the next currency links based on a set of transactions rules to fulfill wholly or partially the next match. Third, traditional netting occurs on completion of a series of transactions. For example, if Party A is obligated to pay Party  
15 B three units of a currency and Party B is obligated to pay Party C three units of a currency, a netting transaction would have Party A pay Party C three units of currency directly. In this embodiment, transactions are synthesized by matching source (available) currency to beneficiary (desired) currency requirements. As such the transaction could be deemed a netting 'hybrid'.

20 The present system may be further understood with reference to Figures 3A and 3B, which each show a schematic of the major elements in a foreign exchange matching system in accordance with the present invention. Figure 3A is an actual proposed architecture schematic for an FX embodiment prepared by Primix Solutions Inc; the  
25 embodiment is called 'BuyFX'. The functions of the major blocks in Figure 3A and 3B are the same and are as follows: the party and counterparty each interact with the foreign exchange matching system using their web browsers (1, 2), which communicate via the Internet 3 with a conventional Web cluster/firewall 4 connected to an application server cluster 5 running Netscape Application Server, IBM WebSphere or BEA WebLogic. Cluster 5 is connected to a message bus 7, such as  
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ActiveWorks or Tibco. The message bus 7 is connected to a live data feed 6, which provides continuous and up to date pricing information. A Reuters or Bloomberg feed could be used. Message bus 7 is also connected to a mail server 8 which communicates with various entities, including the party and counterparty.

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Message bus 7 is also connected to the matching system server 9, which runs a Java or C++ program calculating not only the mid-point prices (and related spreads, if applicable) using data from the live feed 6 but also identifying where netting opportunities exist to enable a currency match to occur and the nature of the netting. Matching System server 9 is connected to an Oracle database 10. Message bus 7 is connected to the various system financial partners 11 (typically one, but not limited to one, in each jurisdiction whose currency is available for matching through the system). These are typically banks or deposit taking institutions. These partners actually take the payment from and make payments 12 to each party and counterparty in the amounts defined by the matching system server 9.

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Reference should now be made to Figure 4, which is a step by step walk through the process. Figure 4 includes, but is not limited to, the denoted steps to execute a transaction. At step 1, a party with a need for foreign exchange logs onto a secure web site using its browser. Initially, the party has to complete a customer profile and user authentication. This involves the following steps: On entering the secure FX Matching System web portal, the customer has to:

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- (A) Register with the FX Matching System and its jurisdictional banking partners in a secure environment (if a new user), or
- (B) Authenticate its identity with a user name and password (if an existing user).
- (C) If a new user, it also has to enter various administrator-defined restrictions- user restrictions, currency restrictions, volume restrictions e.g. User "XXX" can transact in currency "XXX" and "YYY" only, in volumes not to exceed "XXXXXX".

Once authenticated as a user, the customer will be able to complete a secure submission document using its Web browser (Step 1). This document enables a user to:

(A) List, in a secure environment, commonly used source accounts and beneficiary accounts.

(B) Enter an electronic funds transfer request, with funds moving from a source account to a beneficiary account at a jurisdictional banking partner, if necessary.

Once its funds have been deposited and the cleared funds are "held" by a jurisdictional banking partner, the customer is able to 'post' funds using the browser based submission document as follows:

(A) By requesting a conversion on a defined source amount (e.g. the customer has a source quantity of \$1M USD which it requires to be converted to CAD), or

(B) By requesting a beneficiary amount, the computer program will calculate the quantity of source funds required, utilizing a "buffer percentage" to account for potential currency fluctuations. The "buffer percentage" is a convenience feature for customers and will be calculated on a currency specific basis at two standard deviations of the daily fluctuation of the currency.

The secure submission document also allows each user to define the kind of transaction required. Examples of user-defined functionality include, but are not limited to, the following :

(A) 'Match' – the exchange transaction is completed as and when reciprocal funds become available in whole or in a series of partials for a customer to fulfil a currency order; this process can be time-sensitive. Implicit in the Match order is end of day execution of any unfilled balances, unless the customer has his own beneficiary account and elects to bypass that option;

(B) 'Match (All or none)' – the exchange transaction is completed only as and when a complete block of currency (as a series of partials or in one reciprocating block) becomes available to fulfill a currency order; (again, this can be time-sensitive);

(C) 'Match and Market (M & M's)' – a time sensitive order to fill the customer currency requirement with as much "matched" currency as is available during a user-defined period of time, with the option of executing the balance at the prevailing market rate with a banking partner or financial institution;

(D) 'Market' – an order allowing a customer to bypass the matching process and go directly to a jurisdictional partner for execution; this can be time-sensitive;

(E) 'Special Liquidity' – certain corporate partners, and, in some circumstances, regular customers will be able to submit orders at preferred rates to augment liquidity. "D-SL" orders never have precedence over regular "Direct" orders.

The Submissions Document is then securely transmitted (step 2) to the Matching System Server (B). The Matching System Server (B) then requests (step 3) the appropriate financial institution (C) to verify the information given by the party (including the availability of funds) and to authenticate the user from the financial institution's perspective. An account held with this multi jurisdictional financial partner(s) serves nothing but a transactional purpose through which funds are matched and distributed. The multi jurisdictional financial partner(s) accepts funds on account in the currency by which they were deposited. Correspondingly, this institution delivers funds to the customer in the beneficiary currency at the prescribed rate of exchange. All currency exchange is electronic so that no physical securities are required for clearing.

Once the financial institution (C) has confirmed that the user has the required funds to be exchanged it in effect freezes those funds, and then authorises the matching system (step 4) to post the required information and proceed with the transaction. The Matching System (D) then performs the netting identification process illustrated at Figure 2B, using the mid-point prices it calculates using the data from live feed (A).

Matching System (D) uses the following order prioritisation feature. In order to prevent one company and/or transaction from "locking out" other customers by placing a substantial order in relation to the available liquidity, customers will be able to place orders to a maximum size of "X" USD equivalent. The software will accept  
5 volumes in excess of this size. These will be automatically processed into a series of smaller transactions, determined by the Matching System (D) and contingent on the liquidity of the currency. Execution of these smaller transaction volumes will occur in sequence with the initial block being completed on a "first in, first out", followed by the next Matching System (D) customers in that currency, if any, on a FIFO basis;  
10 followed by the second block from the transaction; followed by the next customers in that currency, if any, and so on until the cumulative volume is filled. This prevents one customer from monopolizing any one currency to the detriment of other customers.

Where a successful match has occurred, the Matching System (D) notifies the various  
15 financial institutions to complete the funds transfer. More exactly, transactions are aggregated by Matching System (D), reconciled, and recorded to one central file per jurisdictional financial institution. The "batched" files are transmitted to the jurisdictional partner (step 5).

20 Notification arises through the Matching System (D) issuing an 'International Payment Instruction'. This is an order to a financial partner to record payment instructions to a customer defined beneficiary account;

25 Issuance of the 'International Payment Instruction' will occur under, but will not be limited to, the following conditions:

- (A) When a customer is "matched" fully
- (B) When a customer is filled at the end of the day
- (C) When a "Match and Market" order has been fulfilled.
- 30 (D) If customer selects "Market" or "Match (All or none)" order.

(E) If a customer elects to carry an order over a number of days, until that order is filled in its entirety, the direction to pay option to a Payee Account remains unavailable. In that circumstance, the customer must maintain his own beneficiary account.

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In addition to handling International Payment Instructions, the system can equally well handle Domestic Payment Instructions – for corporations who seek to transfer funds domestically.

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In addition to issuing the International Payments Instruction, the Matching System (D) records the transaction details and time-stamps them. Pricing is also screened by the Matching System (D) for anomalous trades to ensure transaction integrity. Matching System (D) also causes an e-mail customer notification of a match to be issued, pending final payment and settlement.

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Payment instructions are then confirmed, aggregated, and reconciled at the financial partner. Payment is subsequently effected (step 6) to the denoted beneficiary accounts (payee or customer). Each jurisdictional banking partner will release funds at the earliest available opportunity after the daily batching function. Confirmation details are recorded for transmission to customers; confirmation email and online transaction reporting details are transmitted to each customer (step 7). Call centre functionality allows customer to gain transaction details should their ISP be experiencing technical details. At step 8, each customer can obtain a transaction confirmation certificate (Step 9). The transaction is now fully completed.

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There are various additional aspects to the FX Matching System, which are not illustrated. For example, a product for individuals (business travelers) is available; as is a corporate wholesale product for intermediary exchange requirements; and a “market” product for blue-chip multinationals. The transaction size in these incarnations may dictate the transactions “fee” for executing a currency match; the

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program could, but does not have to automatically categorize the trade into the appropriate product with the appropriate rate scale.

Another use of the system is as an intra/inter corporate netting and money management facility (see The Mechanics of Netting Figure 5), in which currency requirements can be met as the intra corporate currency becomes available in other jurisdictions.

A hedging facility for foreign exchange exposure may also be included, in which matched forwards can be offered by the jurisdictional financial partner.

In addition, exposure positions are available to the multi jurisdictional financial partner(s) to mitigate systematic risk with one another.

The system can be implemented as a series of scalable products available for distribution through many different channels through the Internet; the customer may enter the system directly through the denoted web site to transact; the customer may enter via the web site of our multi jurisdictional partner(s) in a co-branded product, or the customer may enter via the web site of a multi jurisdictional partner in a "partner-branded aka white-branded" or non-branded interface. For the retail individual, an affiliation between the present system and a courier and travellers cheques company is possible. This enables a transaction to be completed anywhere in world with the traveller's cheque couriered directly to the individual. This is envisaged as a premium service delivered via the Internet.

As explained above, the system can provide cross-border settlement of accounts, converted to the currency of choice, at exchange rates that represent the closest to fully efficient currency markets. This is particularly advantageous for the small/medium corporate user.



### Clearing transactions

In a preferred embodiment, there is a central clearer (or a group of clearers, presumably financial institutions), with access to the jurisdictions in which currency is both sourced and required. This could be a single financial institution or trustee, or a group of financial institutions or trustees which can secure the transactions. An account held with the clearing body serves nothing but a transactional purpose through which funds are matched and distributed. The central clearer or its affiliates should have the ability to accept funds on account or with a financial institution in the currency by which they were deposited. Correspondingly, this institution delivers funds to the customer in the beneficiary currency at the prescribed rate of exchange. All currency exchange is electronic and no physical securities are required for clearing.

### Payment & Settlement

The simplest scheme involves 2 parties in 2 countries with equal and off-setting obligations. In the United Kingdom, imagine that a party C<sup>1</sup> has £1million GBP (Great Britain Pounds) in available funds in a bank account in the United Kingdom and needs to pay \$1.5million (US dollars) to its supplier A in the US. In the US, party C<sup>2</sup> has \$1.5million in available funds in a bank account and needs to pay £1million to its supplier B in the UK. Assume for simplicity that the exchange rate is \$1.5 per GBP. Conventionally, C<sup>1</sup> might wire transfer \$1.5million (US dollars) to supplier A in the US: that process involve the complex steps involving numerous parties explained in the Description of the Prior Art section of this specification.

Likewise, C<sup>2</sup> might wire transfer £1million to supplier B in the UK, with equivalent steps. This prior art process is however relatively expensive and slow. In the system of the present invention, shown in Figure 1, however, a central computer system is fed the payment obligations of each party, and rapidly spots that a simple swap of obligations is possible. It then causes party C<sup>1</sup>'s £1million to be paid to supplier B in settlement of C<sup>2</sup>'s payment obligation to supplier B and also causes C<sup>2</sup>'s \$1.5million to be paid to supplier A in settlement of C<sup>1</sup>'s payment obligation to supplier A.

As noted above, this rudimentary 2 party example is offered as an introductory example of the underlying concept. In practice, there will likely be many parties and many countries.

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As a somewhat more complex example, a 3 party example would operate as follows. In this example, a new intermediary, BuyFX.com, is introduced. BuyFX.com operates the central computer system underlying the present invention.

10 Assume the following simple scenario, depicted in the table at Figure 1.0 below:

- Corporations:  $C^1, C^2, C^3$
- Corporation's Domestic Financial Institution:  $FI^{C1}, FI^{C2}, FI^{C3}$
- Corporation's Foreign Financial Institution:  $FI^{FC1}, FI^{FC2}, FI^{FC3}$
- 15 • BuyFX.com's Correspondent Banking Partners:  $FI^{BFX1}, FI^{BFX2}, FI^{BFX3}$
- $C^1$  - Owns GBP; Requires USD;
- $C^2$  - Owns USD; Requires YEN;
- $C^3$  - Owns YEN; Requires GBP

20 In this example,  $C^1$  cannot satisfy its requirements in whole or in part by dealing with  $C^2$  exclusively. However, if  $C^3$  can be "linked" into the transaction, all three corporations can be satisfied to the value of the smallest available currency.

25 Therefore, in simple terms, if  $C^1$ 's USD requirement could be satisfied via  $C^2$ ,  $C^2$ 's YEN requirement via  $C^3$ ,  $C^3$ 's GBP requirement via  $C^1$ , you could reduce the number of participants in any leg of a transaction. That is, the various "cross border" elements of a transaction become nothing more than a series of netted domestic transactions.

Where previously there could be 18 or more participants over 3 transactions, there is now a maximum of 15, with a minimum of 9 (assuming distinct financial institutions in each jurisdiction).

5 The relationship and methodology to achieve this end is depicted in Figure 1.

The fundamental requirements for this system are:

10 • A central computer system, networking participating financial institutions, which calculates transfer amounts and electronically instructs financial institutions in the area of funds direction. (FEDI)

A network of financial institutions (one or more), which has available to it the mathematical and communications software to relay customer instructions regarding the transfer of funds to a payee.

15 A central computer system, which uses batch file processing to execute recorded transactions and direct payments accordingly.

Referring to Figure 3, each party using the BuyFX.com system (i.e. C<sup>1</sup>, C<sup>2</sup>, and C<sup>2n</sup>) instructs its own domestic financial institution that it requires a foreign exchange payment to be made. That can be done in several ways; for example, each party could access a BuyFX.com web site and enter the details of the amount and the payee; it would previously have entered into a mandate with BuyFX.com so that any instructions given by it in an authorised manner to the BuyFX.com web site triggers an automated debiting of cleared funds from that party's bank account into the BuyFX.com correspondent bank. Hence, when C<sup>1</sup>, which banks in GBP, instructs its bank FI<sup>C<sup>1</sup></sup> that it wishes a USD payment to be made to its US supplier, then, the equivalent amount in GBP is debited from the cleared funds in the account of C<sup>1</sup> held at FI<sup>C<sup>1</sup></sup> and transferred to FI<sup>BuyFX</sup>. Generally, that will only occur after the Central System of BuyFX.com has determined that a match can be established which will led to a full or partial satisfaction of several parties payment obligations. That requires the

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Central System to monitor all foreign exchange requests, and, when it spots a match, to inform the BuyFX.com correspondent banks,  $FI^{BFX1}$ ,  $FI^{BFX2}$  etc, over the FEDI network. The BuyFX.com correspondent bank in a given jurisdiction then pulls payment from the payer's domestic financial institution and forwards it to the foreign financial institution acting for the party who wishes to make a payment to a payee in that same jurisdiction (e.g. in the case of GB in Figure 1, the payee in GB is C's supplier, where C is based in Japan. Hence, the BuyFX.com correspondent bank in GB sends the GBP it has obtained from C's bank money to C's GB foreign financial institution,  $FI^{C3}$ , who then passes it to the GB payee in satisfaction of C's debt to that payee.

Further detailed aspects of an implementation are contained in the following appendices, in which:

1. Appendix 1, which details the searching methodology and algorithm; and
2. Appendix 2, which details the transaction aging procedure and the order of operations; and
3. Appendix 3; which details the matching algorithm and netting (hybrid) procedure

## Appendix 1 – The Searching Methodology and Algorithm

- 5 1. Each currency is assigned a unique base ten exponential value henceforth known as an Assignment Value (AV) see Table 1.0 below. Example: GBP-AV 1.E+02
2. Source Currency Assignment Value (SCAV) e.g. SCAV for USD = 1.E+00  
Beneficiary Currency Assignment Value (BCAV) e.g. BCAV for CAD = 1.E+01 see
- 10 Glossary of Terms.

Table 1.0: Assignment Values

#	Currency	Values	Exponential
1	USD-AV	1	1.E+00
2	CAD-AV	10	1.E+01
3	GBP-AV	100	1.E+02
4	JPY-AV	1000	1.E+03
5	EUR-AV	10000	1.E+04
6	AUD-AV	100000	1.E+05
7	CHF-AV	1000000 1000000	1.E+06
8	ZAR-AV	0	1.E+07

3. To distinguish between currency combinations, one aggregates the assignment values of the underlying currencies. Example CAD/GBP/EUR = 10110. No other currency grouping can generate this assignment value. Each grouping has its own unique assignment value.
- 15 4. Key to the process is that no combination of assignment values can be aggregated to equal the assignment value of any other currency. A base ten searching mechanism provides this characteristic.
- 20

5. Using AVs from Table 1.0, one can generate matches mathematically. See Example 1.0.

6. The searching mechanism has a finite number of combinations that can be easily defined by Formula 1.0.

7. Formula 1.0: Total Combination Calculation

$$T(n,x) = C(n,x) + C(n,x-1) + C(n,x-2) + \dots + C(n,2)$$

10 where C represents the number of combinations given n, the size of the universe and x, the number of elements in any one combination; x can be less than or equal to n and greater than or equal to 2.

8. Examples: Eight and Nine Currency Environments

15 Therefore, in an eight currency environment, the total number of combinations equals:

$$T(8,8) = C(8,8) + C(8,7) + C(8,6) + C(8,5) + C(8,4) + C(8,3) + C(8,2)$$

$$T(8,8) = 1 + 8 + 28 + 56 + 90 + 56 + 28$$

$$T(8,8) = 267 \text{ maximum combinations assuming we accept all possible links.}$$

20 In a nine currency environment, the total number of combinations equals:

$$T(9,9) = C(9,9) + C(9,8) + C(9,7) + C(9,6) + C(9,5) + C(9,4) + C(9,3) + C(9,2)$$

$$T(9,9) = 1 + 9 + 36 + 84 + 126 + 126 + 84 + 36$$

$$T(9,9) = 502 \text{ maximum combinations assuming we accept all possible links}$$

25 9. Note that the above equation is terminated at C(n,2) as two items at least are necessary to generate a match.

30 10. Note that the above equation can readily generate the number of available combinations should BuyFX.com wish to limit the matching procedure to any maximum

number of participants. For example, BuyFX.com could have a 20 currency environment with a maximum of 6 participants to a transaction: mathematically the number of possible combinations to reflect these parameters can be described as:

- 5             $T(n,x) = C(n,x) + C(n,x-1) + \dots + C(n,2)$  where  $n$  is the number of available currencies and  $x$  is the maximum number of participants in any one transaction.

For a 20 currency environment, with a maximum of 6 participants to any one transaction:

- 10            $T(20:6) = C(20,6) + C(20,5) + C(20,4) + C(20,3) + C(20,2)$   
 $T(20:6) = 38,760 + 15,504 + 4,845 + 1,140 + 190$   
 $T(20:6) 60439$  possible combinations

11.        Source Currency Assignment Value (SCAV) is compared to the Beneficiary Currency  
 15 Assignment Value (BCAV) to generate the match(es). Where the  $SCAV = BCAV$  for the same subset of clients, a match exists.

## 12.        Example 1.0

### Numerical Example: Searching Methodology

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#### *Assumptions*

- a. Randomly entered data points denoting source and beneficiary currency req'ts.
- b.        All transactions entered at time  $t=1.0$ ; hence no transaction in the example has  
 25 precedence based on time.
- c.        Source Currency        USD  
           Beneficiary Currencies CAD    CHF
- 30 d.        Source Currency        CAD

Beneficiary Currencies JPY AUD

e. Source Currency GBP  
Beneficiary Currencies USD EUR

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f. Source Currency JPY  
Beneficiary Currencies GBP ZAR

10 g. Source Currency EUR  
Beneficiary Currencies USD

h. Source Currency AUD  
Beneficiary Currencies EUR

15 i. Source Currency CHF  
Beneficiary Currencies USD GBP ZAR

j. Source Currency ZAR  
Beneficiary Currencies EUR

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13. The above observations could be illustrated numerically as in Table 1.1

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Table 1.1 Assumptions Denoted in Table Form with Corresponding Assignment Values

	USD	CAD	GBP	JPY	EUR	AUD	CHF	ZAR
SCAV	1.E+00	1.E+01	1.E+02	1.E+03	1.E+04	1.E+05	1.E+06	1.E+07
BCAV								
USD	1.E+00		1.E+00		1.E+00		1.E+00	
CAD	1.E+01	1.E+01						
GBP	1.E+02			1.E+02			1.E+02	
JPY	1.E+03	1.E+03						
EUR	1.E+04		1.E+04			1.E+04		1.E+04
AUD	1.E+05	1.E+05						
CHF	1.E+06	1.E+06						
ZAR	1.E+07			1.E+07			1.E+07	

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#### 14. AV Matches

Assumptions: In this example, all transactions aged identically at  $t=1$

Assumptions: In this example, all transactions aged identically at $t=1$								
Match 1	1.E+01	1.E+05			1.E+00	1.E+04		
SCAV	110011	USD,CAD,EUR,AUD				BCAV		110011
Match 2	1.E+06						1.E+00	
SCAV	1000001	USD,CHF				BCAV		1000001
Match 3	1.E+01	1.E+03	1.E+00	1.E+02				
SCAV	1111	USD,CAD,GBP,JPY				BCAV		1111
Match 4	1.E+06				1.E+00		1.E+07	1.E+04
SCAV	11010001	USD,EUR,CHF,ZAR				BCAV		1101000
								1

10 15. By comparing the aggregated assignment values of the source currencies against the beneficiary currencies, one can discover the matches. Where the values are identical, there is a match.

16. Mathematically, this is illustrated as follows:  $SCAV - BCAF = 0$  (Formula 1.1)

Matches: Denoted by source and beneficiary assignment values being equal.

- 5      a.      Source Value            110011  
         Beneficiary Value      110011  
         Match: USD    CAD    EUR    AUD
- 10      b.      Source Value            1000001  
         Beneficiary Value      1000001  
         Match: USD    CHF
- 15      c.      Source Value            1111  
         Beneficiary Value      1111  
         Match: USD    CAD    GBP    JPY
- 20      d.      Source Value            11010001  
         Beneficiary Value      11010001  
         Match: USD    EUR    CHF    ZAR
- 20      17.      Since the subset of required assignment values is finite; the searching procedure is easily executable.
- 25      18.      The system is easily scalable with the addition of currencies see #4 above. The maximum number of combinations is finite and can be defined. As this relates to CPU capacity, the requirements can be estimated with confidence.

## Appendix 2 – Transaction Aging Procedure and Order of Operations

1. While the Searching Algorithm provides a very clear methodology to exposing matches mathematically. Consideration must also be given to:

- i. the Transaction Aging Process
- ii. the Order of Operations

2. The Transaction Aging Process is a time-based order management procedure through which entries are prioritized on a first in, first out basis, subject only to the parameters and limitations of either the BuyFX.com Transactions Rules or User Defined Parameters.

3. Order of Operations is a combination of Transaction Rules and User Defined Parameters, which necessitate unique treatment of the data entry in question. For example, if a customer tags the "All or none" order, the system must provide for this restriction by ensuring that the complete execution of the order can occur prior to engaging this entry in any transaction.

4. The Transaction Aging Process

- i. Given that the user entry requires no special treatment in relation to the BuyFX.com Transactions Rules, and that the entry is not tagged with a user defined limitation, precedence of one entry over another is exclusively time based. In other words, the first entry into the system will, ceteris parabis, have priority over any subsequent entry.

5. Example 1.0

Table 1.0: Assignment Values

#	Currency	Values	Exponential
1	USD-AV	1	1.E+00
2	CAD-AV	10	1.E+01
3	GBP-AV	100	1.E+02
4	JPY-AV	1000	1.E+03

Randomly entered data points denoting the following transactions conditions:

At  $t=1.0$ ; USD-SC; CAD-BC, therefore  $SCAV = 1$ ,  $BCAV = 10$

At  $t=1.1$ ; EUR-SC; USD-BC, therefore  $SCAV = 100$ ,  $BCAV = 1$

At  $t=1.2$ ; CAD-SC; EUR-BC, therefore  $SCAV = 10$ ,  $BCAV = 100$

At  $t=1.3$ ; USD-SC; EUR-BC, therefore  $SCAV = 1$ ,  $BCAV = 100$

where SC is Source Currency & BC is Beneficiary Currency

## 6. Transaction Aging Procedure

	SC	USD	CAD	EUR	JPY
	SCAV	1	10	100	1000
BC	BCAV				
				T=1.1;	
USD	1			AV=1	
CAD	10	T=1.0; AV=10			
		T=1.3;	T=1.2; AV=10		
EUR	100	AV=100	0		
JPY	1000				

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## 7. AV Matches by Age

	I.	At T=1.0	No match	
	II.	At T=1.1	No match	
10	III.	At T=1.2	Match	SCAV=BCAV=111
	IV.	At T=1.3	Match	SCAV=BCAV=101

## Notes:

- 15 I. Match at T=1.3; if USD and EUR  
remaining in the queue after Match at T=1.2.
- II. If USD or EUR supply exhausted at  
T=1.2, Match at T=1.3 will not occur.
- 20 III. If observation at T=1.3 occurs prior  
to T=1.2: Match AV=101 will have priority over Match AV=111. In this

example Match  $AV=111$  will not occur as one, of either, USD or EUR would be exhausted.

## 8. The Factors Influencing the Order of Operations

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Time Stamp - per Aging Rules above

Size - parceling if necessary to ensure customer fulfillment and prevent "monopolization" by any one customer.

Type of Transaction - Match; Match and Market, Match (All or None), Market, Special Liquidity

User Defined Parameters - price limits, duration, etc.

### Appendix 3 – The Matching Algorithm

1. By combining the BuyFX.com Searching Algorithm with the Transactions Aging Procedure, AV Matches can be discovered. (see BuyFX Searching Algorithm and BuyFX Transaction Aging Methodology & Order of Operations)

2. When an AV Match is discovered via the BuyFX Searching Algorithm, at least two clients will be party to the transaction. The limiting factor to the transaction will, therefore, be the least supply of currency (or the smallest Source Currency Quantity or SCQq) among the parties to the transaction. eg. Assume AV Match = 101 (GBP and USD); one client has 100,000 USD for GBP and another has 100,000 GBP for USD; USD/GBP = .62225: the limiting factor to this transaction is the SCQq of 100,000 USD. Therefore, the client with SC=USD and BC=GBP will receive all of his desired GBP and drop from the queue. All other parties will remain in the queue subject to user parameters and transaction rules.

3. To calculate the amount of currency allocated to each of the parties in a transaction:

A. Each supply of currency is denoted in a common or base currency equivalent form. Since USD is the global standard against which all currencies are typically quoted, USD will be used as the base currency for these calculations. Formula 1.0 describes a currency in terms of the base currency, in this case, USD.

Formula 1.0:

$$Q^{\text{USD}}(\text{SC in Base terms}) = \text{SCQ} / \text{SC FX Rate as against the Base Currency}$$

$$\text{or } Q^{\text{USD}} = \text{SCQ} / R^{\text{USD:SC}}$$



Example: To calculate JPY in USD terms,  $R=109.45$ ,  $SCQ=109,450$  JPY

$$Q^{USD} = SCQ^{JPY} / R^{USD/JPY}$$

$$Q^{USD} = 109,450 / 109.45 = 1000 \text{ USD}$$

Therefore, at time  $t$ , 109,450 JPY was equal to 1000 USD.

B. The SCQq is determined, thereby defining the limiting source and quantity of currency against which the other participant volumes can be calculated. Each party to the transaction will undergo the calculation denoted in Formula 1.1 to determine the supply of currency which that particular client will contribute to the transaction ( $SCQ^T$ )

Formula 1.1:

$SCQ^T$  (quantity supplied to the transaction) = SCQq x Source FX  
Rate as against the Base Currency

$$\text{or } SCQ^T = SCQq \times R^{USD/SC}$$

Example: To calculate the volume of source currency contributed to a transaction.

$$\begin{aligned} \text{If the } SCQq &= 10 \text{ USD, and } R^{USD/GBP} = 0.62225, \\ SCQ^{TGBP} &= 10 * 0.62225 = 6.2225 \text{ GBP} \end{aligned}$$

Therefore, the client with SC=GBP would supply 6.2225 Pounds to this transaction and the client with BC=GBP would receive 6.2225 Pounds as a party to this transaction.

4. Consider the following example:

- Client B has 15 CAD as Source Currency Quantity (SCQ) and requires X JPY as Beneficiary Currency Quantity (BCQ)
- Client H has 3000 JPY as Source Currency Quantity (SCQ) and requires Y CAD as Beneficiary Currency Quantity (BCQ)

The prevailing foreign exchange rates are noted in the Table below:

**Sample  
Transaction**

Client	SCQ	FX Rate	SCQ (in USD)		BC	Residual SCQ <sup>R</sup>
		(see Table 7.1)	Formula 1.0	BCQ		
B	15	1.45425	10.31	1128.93	JPY	0
H	3000	109.45	27.41	15.00	CAD	1871.068

SCQ<sub>q</sub> = 10.31 USD

Therefore,

Applying the calculation

$$SCQ^T = SCQ_q \times R^{USD \rightarrow SC}$$

Client B:

$$SCQ^{T \rightarrow CAD} = 10.31 \times 1.45425 = 15 \text{ CAD (therefore "B" provides 15 CAD to "H")}$$

$$BCQ^{T \rightarrow JPY} = 1128.93 \text{ JPY}$$

Client H:

$$SCQ^{T \rightarrow JPY} = 10.31 \times 109.45 = 1,128.93 \text{ JPY (therefore "H" provides 1,128.93 JPY to "B")}$$

$$BCQ^{T \rightarrow CAD} = 15 \text{ CAD}$$

Client B, holding the smaller USD equivalent position, can be executed in its entirety; 1128.932 JPY for 15 CAD.

Client H receives 15 CAD and remains in the queue having available 1871.068 JPY for the next counterparty.

5. To calculate the residual source funds  $SCQ^R$  for the next applicable transaction, one need only subtract the  $SCQ^T$  (the quantity supplied to the transaction) from the original  $SCQ$ .

Formula 1.3:

$$SCQ^R = SCQ - SCQ^T$$

Example: To calculate the volume of source currency remaining after a transaction.

$$\text{If the } SCQ = 3000 \text{ JPY, and } SCQ^{T \rightarrow JPY} = 1128.93$$

$$SCQ^{R \rightarrow JPY} = 3000 - 1128.93 = 1871.07 \text{ JPY}$$

Therefore, the client with  $SC=JPY$  would be ready to supply at most, 1871.07 JPY to the next transaction.

6.       A.       All details of the transaction will be stored to a database for  
aggregation & "batch payment and settlement"
- 5       B.       As currencies fluctuate against the USD, calculations will be  
generated from live data to supply       the client with "real-time" competitive  
pricing.

## 7. Applying the BuyFX Algorithms and Procedures

## 7.1 Sample Foreign Exchange Rate Table

Mid Point FX Rates		
Currency	Quotation	Mid-Point
R USD/CAD	1.45375/475	1.4542
R USD/GBP	0.6220/25	5
R USD/JPY	109.40/50	0.6222
R USD/EUR	0.9860/65	5
R USD/AUD	1.5830/40	109.45
R USD/CHF	1.6270/75	0.9862
R USD/ZAR	6.3260/70	5
		1.5835
		1.6272
		6.3265

Quotations as at 02/16/00

Note: Currency rates are dynamically reflected in the calculations in USD terms at any time T=match. The rates above are merely a static sampling for the purposes of this example.

## 7.2 Sample Currency Assignment Values

#	Currency	Values	Exponential
1	USD-AV	1	1.E+00
2	CAD-AV	10	1.E+01
3	GBP-AV	100	1.E+02
4	JPY-AV	1000	1.E+03
5	EUR-AV	10000	1.E+04
6	AUD-AV	100000	1.E+05
7	CHF-AV	1000000	1.E+06
8	ZAR-AV	10000000	1.E+07

## 7.3 Random Currency Entries using Tables 7.2

	SC	BC	SC-AV	BC-AV	SCQ
T=1.0	GBP	USD	100	1	20
T=1.1	CAD	JPY	10	1000	15
T=1.2	GBP	CAD	100	10	10
T=1.3	JPY	USD	1000	1	800
T=1.4	AUD	USD	100000	1	30
T=1.5	USD	EUR	1	10000	35
T=1.6	CAD	ZAR	10	10000000	15
T=1.7	JPY	CAD	1000	10	3000
T=1.8	EUR	GBP	10000	100	30
T=1.9	CAD	JPY	10	1000	40
T=2.0	EUR	CHF	10000	1000000	25
T=2.1	ZAR	GBP	10000000	100	110
T=2.2	CAD	AUD	10	100000	19.5
T=2.3	USD	GBP	1	100	30

Where SC/BC is Source/Beneficiary Currency; AV is Assignment Value; Q is Quantity

## 7.4 Sample Initial SCQs and AV Matches

Time	Client	SCAV	BCAV	AV-Match	Initial SCQ	Initial Q <sup>USD</sup>
T=1.0	A	100	1	N/A	20	32.14
T=1.1	B	10	1000	N/A	15	10.31
T=1.2	C	100	10	N/A	10	16.07
T=1.3	D	1000	1	N/A	800	7.31
T=1.4	E	100000	1	N/A	30	18.95
T=1.5	F	1	10000	N/A	35	35.00
T=1.6	G	10	10000000	N/A	15	10.31
T=1.7	H	1000	10	1010	3000	27.41
T=1.8	I	10000	100	10101	30	30.42
T=1.9	J	10	1000	1010	40	27.51
T=2.0	K	10000 1000000	1000000	N/A	25	25.35
T=2.1	L	0	100	10000110	110	17.39
T=2.2	M	10	100000	N/A	19.5	13.41
T=2.3	N	1	100	101	30	30.00
T=2.3				100111		

The results of each subsequent client entry are recorded in 7.5 below.

## 7.5 Results of Sample Currency Entries

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
A	T=1.7	B (T=1.1)	15.0 CAD	0 CAD	Client B receives 1128.93244 JPY
		H (T=1.7)	3000 JPY	1871.068 JPY	Client H receives 15.0 CAD
	<p><i>Client B requirement is executed in its entirety and Client B is removed from the queue.</i></p> <p><i>Client H requirement is partially executed and Client H remains in the queue.</i></p>				

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
B	T=1.8	I (T=1.8)	30 EUR	0 EUR	Client I receives 18.92776 GBP
		A (T=1.0)	20 GBP	1.07224 GBP	Client A receives 30.41825 USD
		F (T=1.5)	35 USD	4.58175 USD	Client F receives 30 EUR
<p><i>Client I requirement is executed in its entirety and Client I is removed from the queue.</i></p> <p><i>Client A requirement is partially executed and Client A remains in the queue.</i></p> <p><i>Client F requirement is partially executed and Client F remains in the queue.</i></p>					

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
C	T=1.9	H (T=1.7)	1871.068 JPY	0 JPY	Client H receives 24.86067 CAD
		J (T=1.9)	40 CAD	15.13933 CAD	Client J receives 1871.068 JPY
<p><i>Client H requirement is executed in its entirety; Client H is removed from the queue.</i></p> <p><i>Client J requirement is partially executed and Client J remains in the queue.</i></p>					



**D**

Time	Client	Initial Position	SCQ <sup>R</sup>	Description
T=2.1	G (T=1.6)	15 CAD	0 CAD	Client G receives 65.25529 ZAR
	L (T=2.1)	110 ZAR	44.74471 ZAR	Client L receives 6.41826 GBP
	C (T=1.3)	10 GBP	3.58174 GBP	Client C receives 15.0 CAD
<i>Client G requirement is executed in its entirety and Client G is removed from the queue.</i>				
<i>Client L requirement is partially executed and Client L remains in the queue.</i>				
<i>Client C requirement is partially executed and Client C remains in the queue.</i>				

**E** Using Transaction Aging Rules, Transaction E has priority over Transaction F.

Time	Client	Initial Position	SCQ <sup>R</sup>	Description
T=2.3	A (T=1.0)	1.07224 GBP	0 GBP	Client A receives 1.72317 USD
	N (T=2.3)	30 USD	28.27683 USD	Client N receives 1.07224 GBP
<i>Client A requirement is executed in its entirety and Client A is removed from the queue.</i>				
<i>Client N requirement is partially executed and Client N remains in the queue.</i>				

	Time	Client	Initial Position	SCQ <sup>R</sup>	Description
F	T=2.3	C (T=1.2)	3.58174 GBP	0 GBP	Client C receives 8.37083 CAD
		M (T=2.2)	19.5 CAD	11.12917 CAD	Client M receives 9.11481 AUD
		E (T=1.4)	30 AUD	20.88519 AUD	Client E receives 5.75612 USD
		N (T=2.3)	28.27683 USD	22.52071 USD	Client N receives 3.58174 GBP
<p><i>Client C requirement is executed in its entirety and Client C is removed from the queue.</i></p> <p><i>Client M requirement is partially executed and Client M remains in the queue.</i></p> <p><i>Client E requirement is partially executed and Client E remains in the queue.</i></p> <p><i>Client N requirement is partially executed and Client N remains in the queue.</i></p>					

## 8. Sample Client Positions (after 14 observations)

Client	SCQ	SC	BC	Net BCQ (A)	SCQ <sup>R USD</sup>	%B/A
A	20	GBP	USD	32.14	0.00	0.00%
B	15	CAD	JPY	1128.93	0.00	0.00%
C	10	GBP	CAD	23.37	0.00	0.00%
D	800	JPY	USD	0.00	7.31	100.00%
E	30	AUD	USD	5.76	13.19	69.62%
F	35	USD	EUR	30.00	4.52	13.09%
G	15	CAD	ZAR	65.26	0.00	0.00%
H	3000	JPY	CAD	39.86	0.00	0.00%
I	30	EUR	GBP	18.93	0.00	0.00%
J	40	CAD	JPY	1871.07	1139.42	37.85%
K	25	EUR	CHF	0.00	41.25	100.00%
L	110	ZAR	GBP	6.42	4.40	40.68%
M	19.5	CAD	AUD	9.11	12.12	57.07%
N	30	USD	GBP	4.65	14.01	75.07%

Note: %B/A is the percentage of currency which is, as yet, unfilled after 14 observations.

## 9. Summary of Results

Client	Initial Req't (in USD)	Value Executed (in USD)	% Executed
A	32.14	32.14	100%
B	10.31	10.31	100%
C	16.07	16.07	100%
D	7.31	0.00	0%
E	18.95	5.76	30%
F	35.00	30.42	87%
G	10.31	10.31	100%
H	27.41	27.41	100%
I	30.42	30.42	100%
J	27.51	17.10	62%
K	25.35	0.00	0%
L	17.39	10.31	59%
M	13.41	5.76	43%
N	30.00	7.48	25%
Totals	301.57	203.49	67%

## 10. Observations from Table 8.0

<b>A</b>	Percentage of Transactions executed fully	43%
<b>B</b>	Percentage of Transactions executed partially	43%
<b>C</b>	Percentage of Remaining Transactions	14%
<b>D</b>	Initial USD equivalent value in queue	301.57
<b>E</b>	Value of USD equivalent Matched	203.49
<b>F</b>	Percentage of Value Matched	67%

## 11. Glossary of Terms

**SC**      **Source Currency** - the available currency i.e. the currency to be converted

**BC**      **Beneficiary Currency** - the desired or destination currency i.e. the currency into which the source funds will be converted

**AV**      **Assignment Value** - an identifier used to distinguish one currency from another

eg.  $GBPAV = 1.E+02$ ; AVs are used to source matches between clients (see Searching Algorithm). Currency pairs or multiples have unique AV totals (see Table 7.2); for example, a pairing of CAD & GBP is identified by 110; GBP & USD by 101; CAD & JPY by 1010 etc.

**SCAV**      **Source Currency Assignment Value** - the value assigned to the source currency of a client transaction e.g. if client has GBP for conversion to CAD,  $SC = GBP$ , therefore  $SCAV = GBPAV = 1.E+02$  (see Table 7.2)

**BCAV**      **Beneficiary Currency Assignment Value** - the value assigned to the beneficiary currency of a client transaction e.g. if client has GBP for conversion to CAD,  $BC = CAD$ , therefore  $BCAV = CADAV = 1.E+01$  (see Table 7.2)

**AV Match**      **Assignment Value Match** - by definition, a match occurs when the Source Currency AV of two or more parties is equal to the Beneficiary Currency AV of those same parties;  $SCAV = BCAV$  or  $SCAV - BCAV = 0$  eg. If one client has GBP to convert to CAD and another client has CAD to convert to GBP,

$$SCAV = GBPAV + CADAV = 110 = BCAV = GBPAV + CADAV$$

- 5      **SCQ**      **Source Currency Quantity** - the amount of source currency to be converted
- BCQ**      **Beneficiary Currency Quantity** - the amount of beneficiary currency  
available post-transaction(s)
- 10      **Q<sup>USD</sup>**      Represents a Source Currency in USD equivalent terms; used to compare the  
SCQs of the participants in a transaction to discover the SCQq (see below)
- R**      **Foreign Exchange Rate** - the amount of one currency required to procure  
another
- 15      eg. If 109.45 JPY = 1 USD;  $R = \text{USD/JPY} = 109.45$
- SCQq**      Represents the limiting factor to a transaction, the SCQq is the smallest SCQ  
(or SCQ<sup>R</sup>), as denoted in USD terms, from the participants to a transaction.
- 20      **SCQ<sup>T</sup>**      Represents the quantity of currency contributed by a client in executing a  
transaction.
- $SCQ^T = SCQq \times R^{\text{USD/SC}}$
- 25      **SCQ<sup>R</sup>**      Represents the residual currency post-transaction available in the queue for  
future matches.
- $SCQ^R = SCQ - SCQ^T$

**Queue** All of the SCQ'S available for transactions, prioritized by system transaction rules and user-defined parameters.



## Claims

1. A method of multi-currency funds settlement comprising the following steps:  
funds in a currency X of a first legal person who is situated in country  
X<sup>1</sup> are transferred in whole or part within country X<sup>1</sup> to satisfy in whole or part  
the currency X<sup>1</sup> payment obligations of a second legal person, situated in a  
different country Y<sup>1</sup>;  
and the funds in a currency Y of that second legal person situated in  
country Y<sup>1</sup> are transferred in whole or part within country Y<sup>1</sup> to satisfy in whole  
or part the currency Y payment obligations of a legal person, who may be the  
first legal person or one or more different or additional legal persons.
2. The method of multi-currency funds settlement as defined in Claim 1 in  
which each legal person seeking to transfer foreign currency enters into a computer  
program an amount of foreign currency required and an applicable payee.
3. The method of Claim 2 in which the computer program is hosted on one or  
more web servers.
4. The method of any preceding claim in which funds which are transferred to a  
payee in a given jurisdiction are generated from a series of debits and credits passing  
back to a debit of cleared funds of a bank account held by a legal person in that same  
jurisdiction, that legal person not seeking to transfer funds to that payee but to a payee  
in a different jurisdiction.
5. A computer program receiving data defining the non-domestic payment  
obligations of parties located in two or more countries, and programmed to identify

opportunities to satisfy those non-domestic payment obligations by assigning payment obligations using the funds settlement method defined in Claim 1 - 4.

6. A computer server programmed with the computer program of Claim 5.

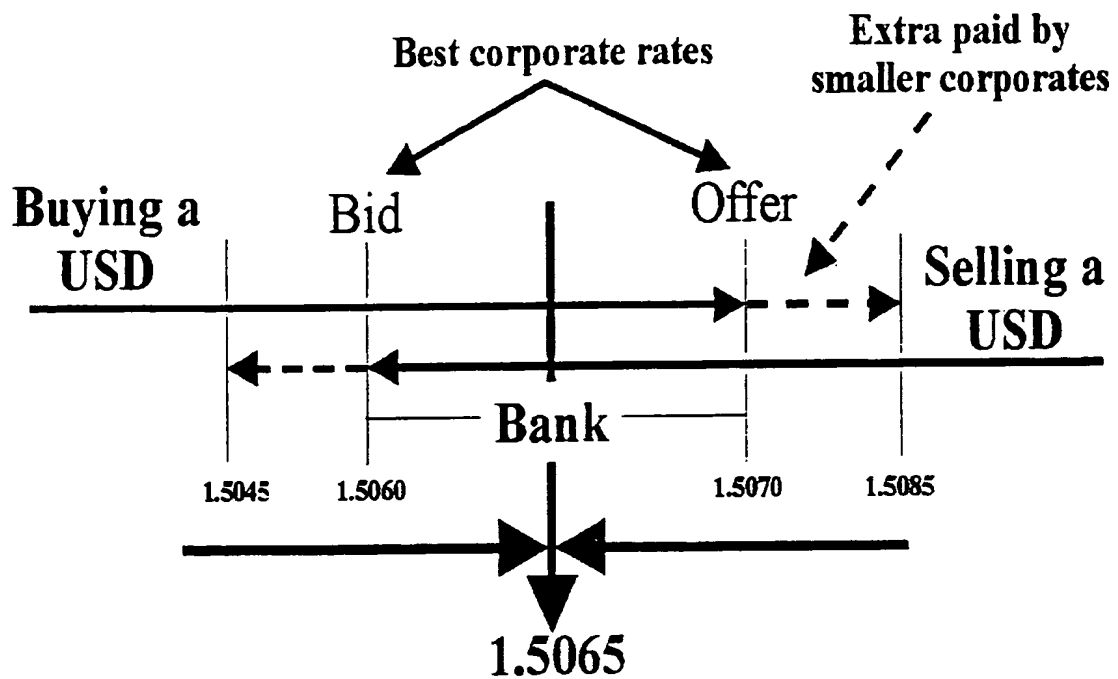
7. A computer terminal acting as a client, in which the client accepts from a party a foreign exchange requirement and sends that requirement to a server as defined in Claim 6.

8. A computer based system which enables parties located in two or more jurisdictions to meet their foreign currency payment obligations, comprising a first computer terminal into which a party located in a first jurisdiction inputs details of a potential first foreign currency financial transaction, a second computer terminal into which a second party located in a second jurisdiction inputs details of a potential second financial transaction, a computer network connecting the first and second terminals; characterised in there being a computer program arranged to determine if any transfer of funds from the first party to a payee located in the first jurisdiction satisfies in whole or part the requirement of the second party to transfer funds to that payee.

9. The computer based system of Claim 8 in which there are numerous computer terminals in numerous countries and the computer program is arranged to determine if any transfer of funds from a party to a payee located in the jurisdiction of that party satisfies in whole or part the requirement of another party to transfer funds to that payee.

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Figure 1



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Figure 2a: PRE-MATCH

Available	10	CAD				
Desired	577.6834	JPY				
Available			4438.77	JPY		
Desired			50	USD		
Available					25	USD
Desired					38.4187	CAD

Figure 2b: POST MATCH

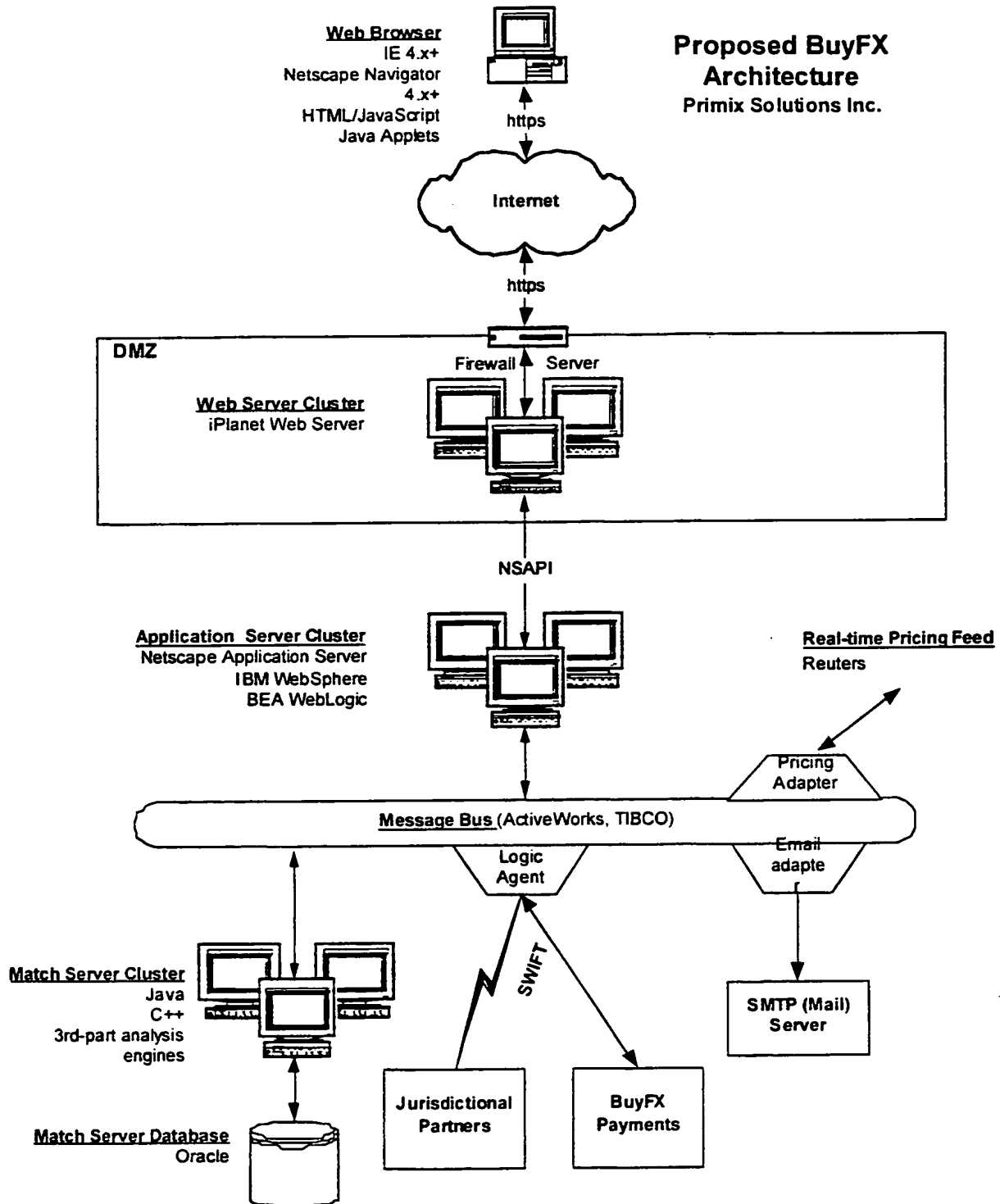
	A	B	C			
Available	0	CAD				
Desired	0	JPY				
Matched	577.6834	JPY				
Available			3861.09	JPY		
Desired			43.4927	USD		
Matched			6.5073	USD		
Available					18.4927	USD
Desired					28.4187	CAD
Matched					10	CAD

Figure 2C

Party/Counterparty	Source Currency	Beneficiary Currency
A	AAA	BBB
B	BBB	CCC
C	CCC	AAA

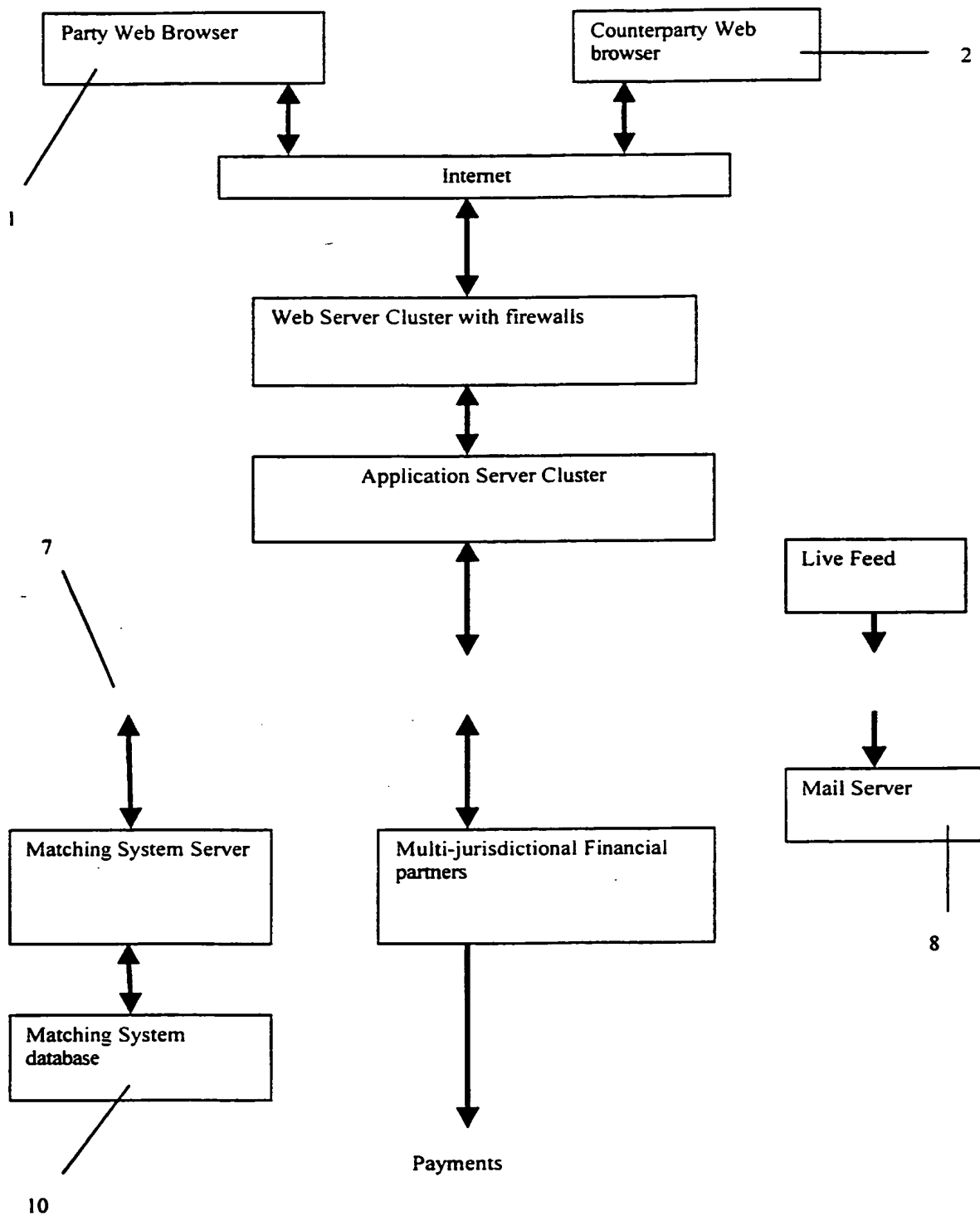
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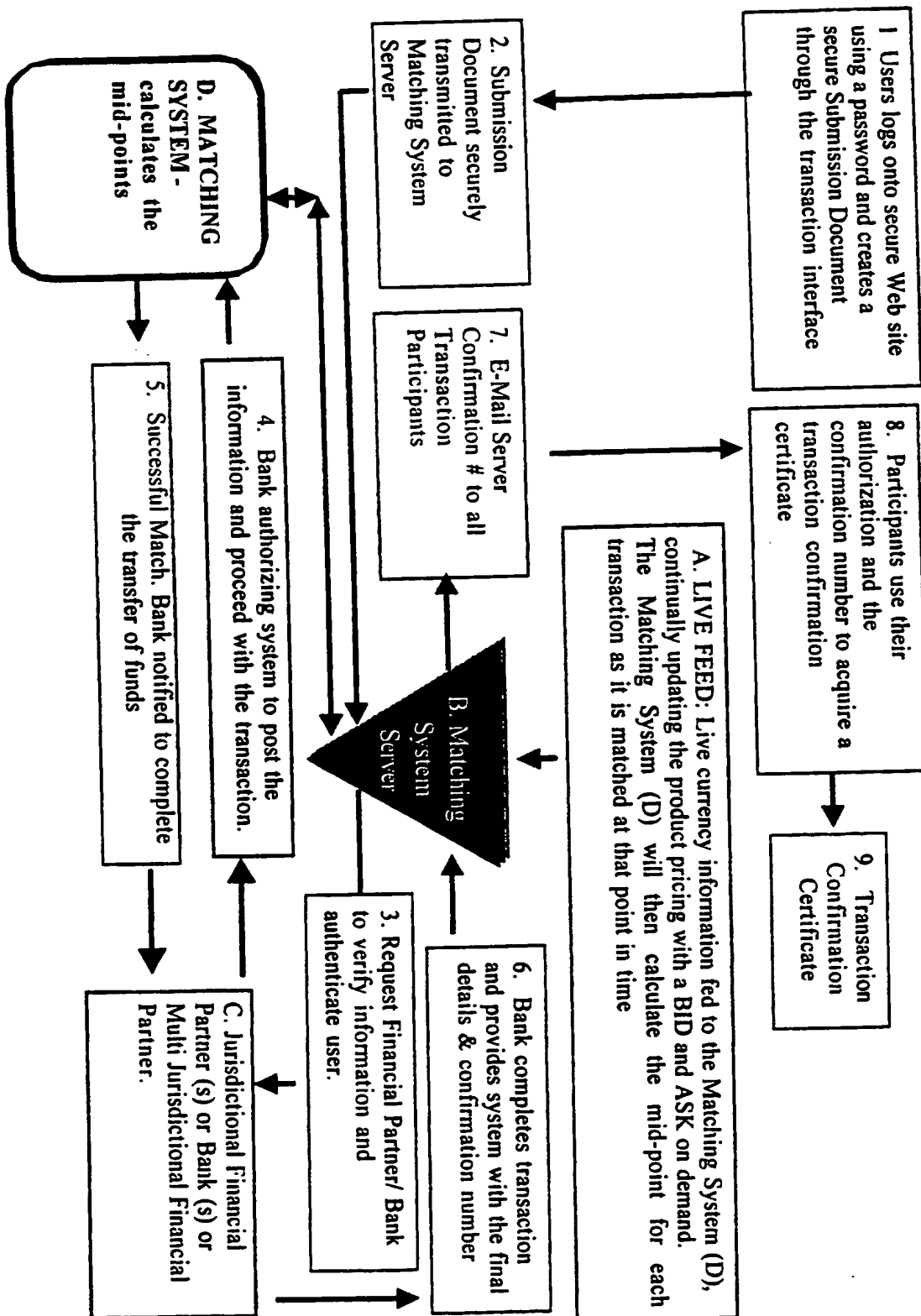
Figure 3A



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Figure 3B

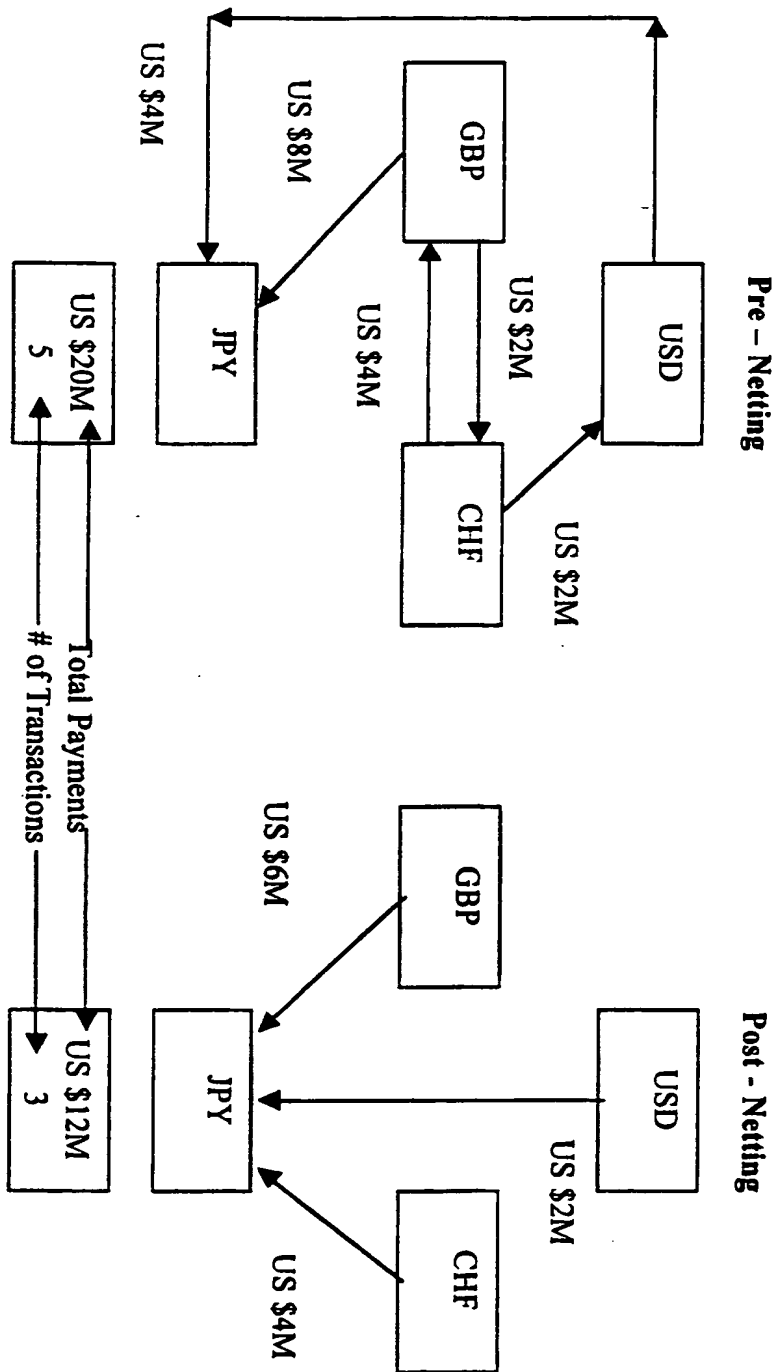




### Figure 4



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Note: All values are USD equivalent in the beneficiary currency of the Payee.

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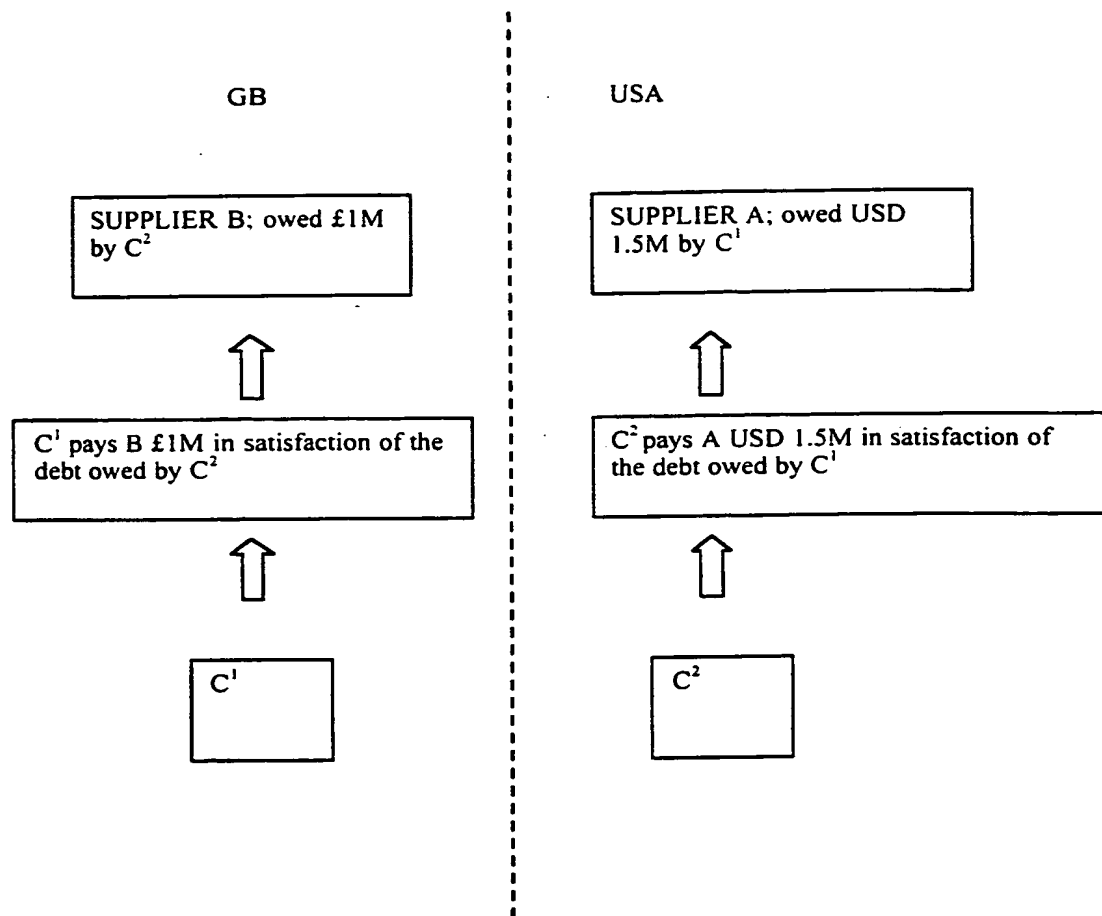


Figure 6

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Corporation	Domestic Financial Institution	BuyFX.com Correspondent Bank	Foreign Financial Institution	Domestic Currency	Required Currency
C <sup>1</sup>	FIC <sub>1</sub>	FIBFX <sub>1</sub>	FIFC <sub>1</sub>	GBP	USD
C <sup>2</sup>	FIC <sub>2</sub>	FIBFX <sub>2</sub>	FIFC <sub>2</sub>	USD	YEN
C <sup>3</sup>	FIC <sub>3</sub>	FIBFX <sub>3</sub>	FIFC <sub>3</sub>	YEN	GBP

Figure 7

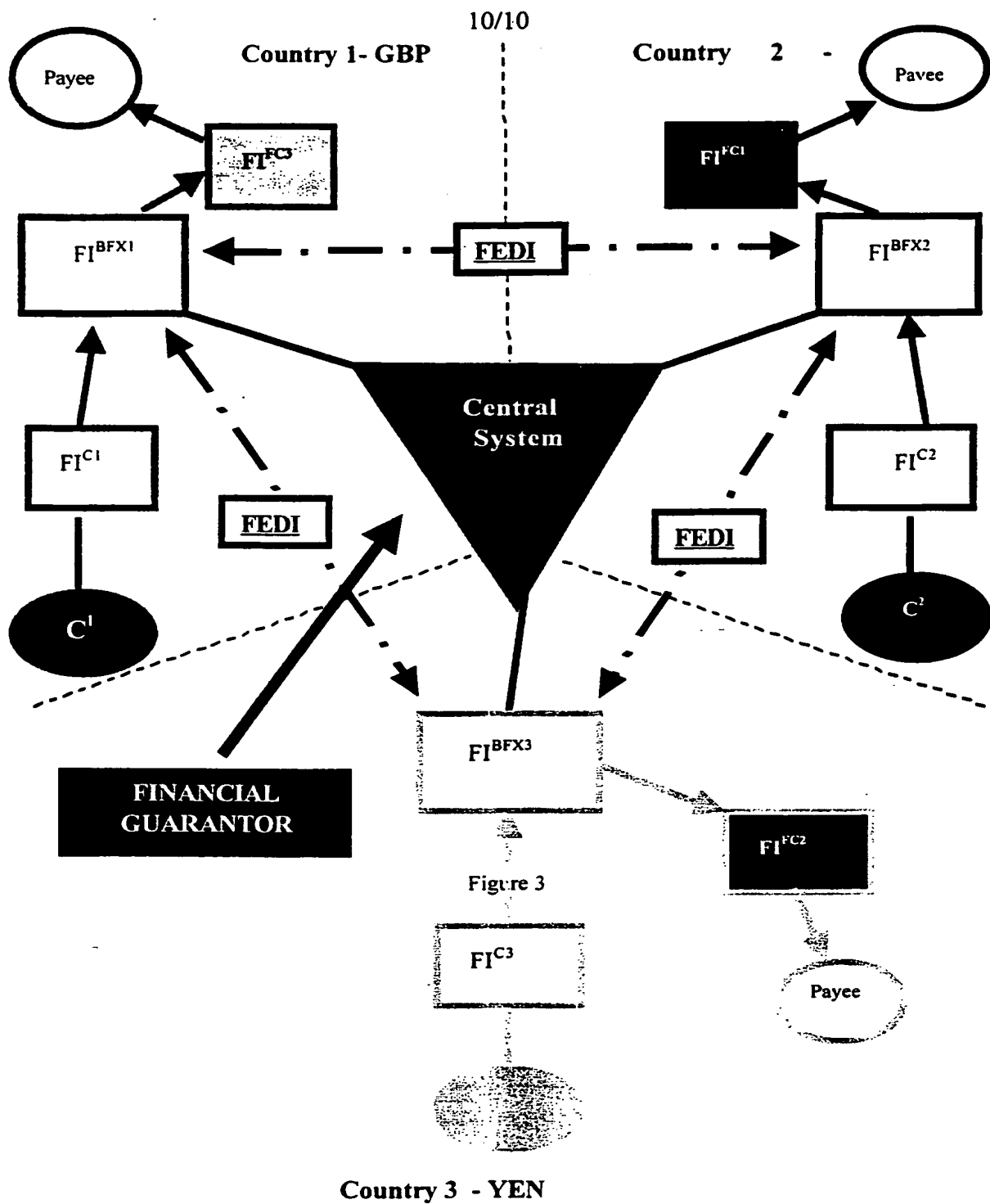


Figure 8